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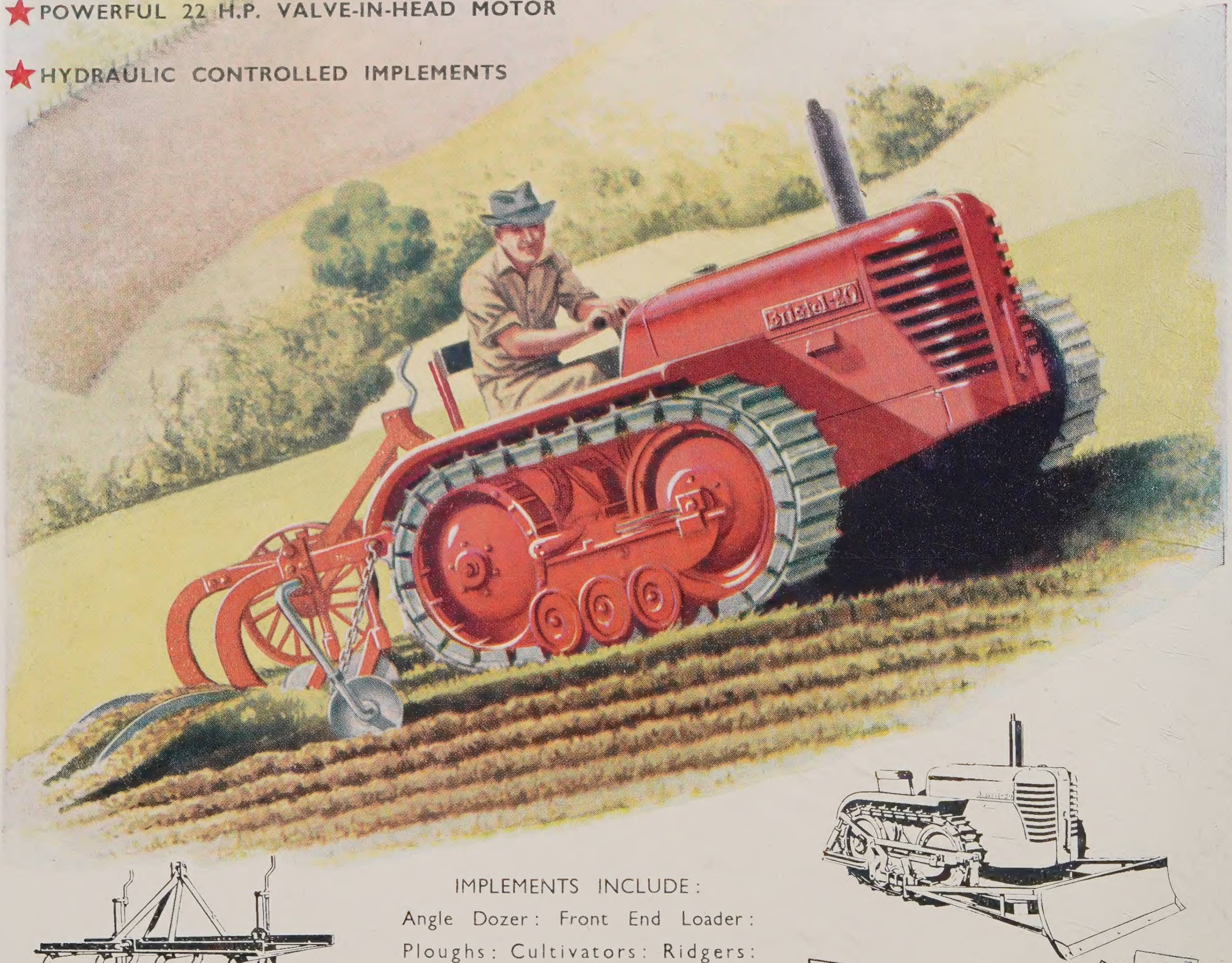

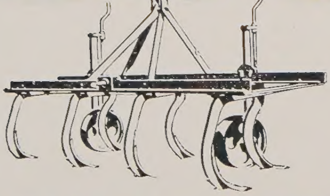

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Hon. E. L. Cullen,
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This month's cover

This month's cover, which is reproduced from a coloured photograph by Neuline Film Studios Ltd., Auckland, shows the Waikato River where it drives between narrow, rocky banks at Atiamuri, 28 miles south-west from Rotorua. Already the waters of the Waikato River assist in generating the power at two of the main North Island hydro-electric stations, Arapuni and Karapiro. A third station, Maraetai, is in course of construction and when it and the seven others projected are completed the Waikato River will be harnessed for many miles above its furthest navigable point.

Cambridge.

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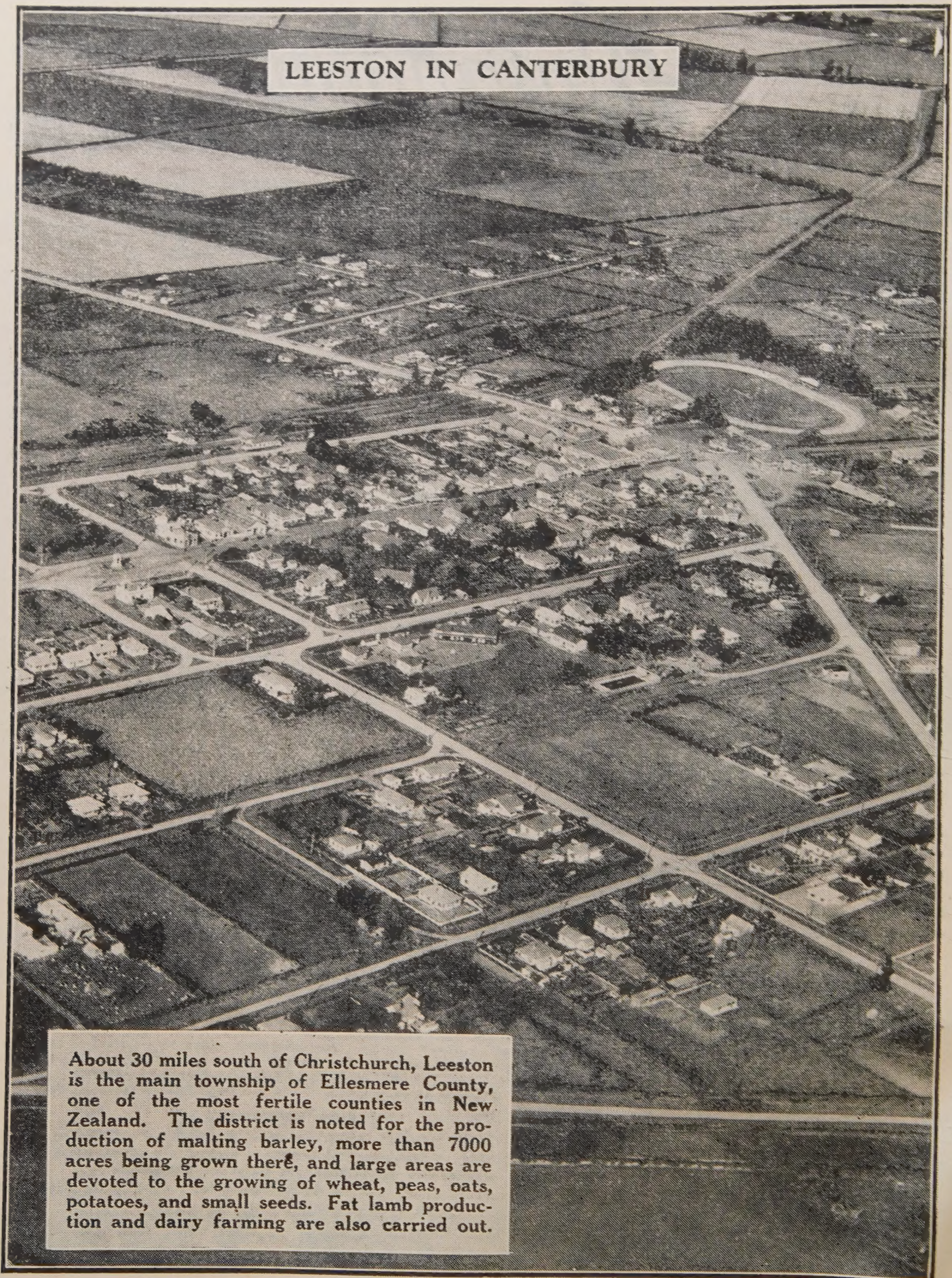


LEESTON IN CANTERBURY

About 30 miles south of Christchurch, Leeston is the main township of Ellesmere County, one of the most fertile counties in New Zealand. The district is noted for the production of malting barley, more than 7000 acres being grown there, and large areas are devoted to the growing of wheat, peas, oats, potatoes, and small seeds. Fat lamb production and dairy farming are also carried out.

[V. C. Browne photo.

New Zealand's Annual Report to FAO

UNDER the constitution of the United Nations Food and Agriculture Organization member Governments undertake to report periodically to one another through FAO on progress made toward the achievement of FAO's basic objectives. New Zealand's 1949 report has recently been completed and dispatched to FAO headquarters in Washington.

In accordance with the outline suggested by FAO this year's report consists of three sections. Part I is a statement of some of the general economic factors that influence the trends in food consumption and in farm, forest, and fishery production in New Zealand. Part II sets out the levels of production, exports or imports, and consumption that seem likely to be achieved or required in the 1950-51 season, and Part III describes the efforts that have been and are being made toward realising the objectives of FAO.

It will be evident from this outline that the report is fairly comprehensive. The preparation and checking of the material have been made possible by the helpful co-operation of various Government Departments, including Health, Scientific and Industrial Research, Marine, Forest Service, and the Government Statistician. Although designed originally for the information of other member Governments of FAO, the New Zealand report may prove by virtue of its comprehensive nature to be of interest to some readers within the Dominion.

Basic Factors in Standard of Life

Several interesting features of the New Zealand economy are brought out in the first part of the report. For instance, it is shown that about 20 per cent. of our total working population is engaged in agriculture. This figure does not fully reveal the significance of farming in the economy of New Zealand. The fact is that our farming is geared to produce for export, and farm products are about 95 per cent. of our total exports. Workers in the meat- and dairy-processing industries, of course, along with workers in transport and distribution and those on farms, contribute to the final value of these exports. As it is only by exporting that we can import the things we need without incurring debt overseas, it is clear that the production and processing of farm products are basic factors in our whole standard of life.

The pattern of food consumption in New Zealand is appropriate to a high standard of living. Over the last 10 years consumption of liquid milk per head rose slightly from a level already high, ice cream consumption trebled, and flour consumption increased slightly.

The rationing of butter and meat during the war years and afterward distorted the influence of higher incomes on the amount of different foods that people buy. Under rationing the consumption per head of butter and of beef, veal, and pork was reduced. After the abolition of meat rationing in September, 1948, it would appear from preliminary indications that the consumption per head of beef, lamb, and pig meat has shown some slight increase, although the position will not be clear until the records for a full year have been analysed.

Forecasts of Production and Consumption

Many uncertainties, of course, attach to the forecasts of New Zealand's production, trade, and consumption of agricultural products in the 1950-51 season as given in the second part of the report. Our pastoral production depends on the climatic conditions that affect the growth of grass, and it is impossible to forecast these a year ahead. Nevertheless, FAO is particularly anxious to have production and consumption targets or forecasts from member Governments for 1950-51 so that the world prospects in food and agriculture can be set before the annual conference of FAO when it assembles at Havana in November next.

The net effect of the production and consumption trends on foreign trade prospects will vary for different products. The 1950-51 import requirement of wheat will probably be larger than at present. Exports of lamb and mutton and beef and veal should be fairly well maintained, but exports of pig meat may fall further; exports of dairy produce should increase. These forecasts are based on long-time production averages and the expectation of a normal season, as no allowance can be made for the possible effect of favourable or unfavourable weather during the 1950-51 season.

Levels of Nutrition

In response to FAO's request the third part of the report describes the measures being taken to achieve increased production of primary products and to secure even higher levels of nutrition in New Zealand. The present nutritional status of our population is relatively very good, and the Department of Health is constantly on the watch for any deficiency that may affect special groups.

Under the heading of agricultural production FAO is especially interested in the extent to which the results of scientific research are being applied by farmers. On this point it is very gratifying to be able to report that New Zealand is well ahead. There are no doubt some improved methods developed by science which have not yet been widely enough adopted by farmers, but in general the relatively high level of efficiency which is justly attributed to New Zealand agriculture has resulted from the ready and widespread adoption by farmers of advances worked out by scientists and made available to the farming community by extension workers. The use of Certified seeds is a familiar illustration.

Control of Mastitis and Contagious Abortion

Two more recent examples of great significance to the dairy industry are penicillin treatment for the control of mastitis and the vaccination of heifer calves to control contagious abortion. A major development during the past year has been the widespread use of the penicillin method by dairy farmers, with remarkably good results. Farmers have also taken up calf vaccination very readily, and I was able to report to FAO that more than half of our dairy heifers are being treated against contagious abortion. Some increase in the dairy herd is expected as a direct result of the adoption by farmers of these new disease-control methods.

Contribution of Knowledge and Experience

It is becoming increasingly clear that the main significance of FAO to New Zealand is that it provides a channel through which we can make available to the people of other and less fortunate nations the specialised knowledge of pastoral production and grassland farming which our farmers and scientists have built up. The contribution of this knowledge and experience is an important way in which we can assist the people of the economically-backward countries to raise their levels of living and of nutrition. It is thus a vital contribution to constructive peace.

—EDWARD CULLEN, Minister of Agriculture.

CARE OF LIVESTOCK DURING OCTOBER

Contributed by the Animal Research Division.

BLACK-HEAD IN POULTRY

BLACK-HEAD disease affects young turkeys and poultry and it can best be prevented by rearing these on land which has not been contaminated by adult poultry. If an outbreak occurs, kill all affected birds and move the remainder to clean ground. In the event of a bad outbreak the local Poultry Instructor should be consulted, because in some cases treatment may prove beneficial.

* * *

BLACK DISEASE VACCINATION

In the east coast areas of the North Island where black disease of sheep occurs vaccination should be carried out during November or early December. This gives protection against the disease, which occurs mainly in summer and autumn. Vaccine should be ordered immediately.

* * *

CATTLE TICK CONTROL

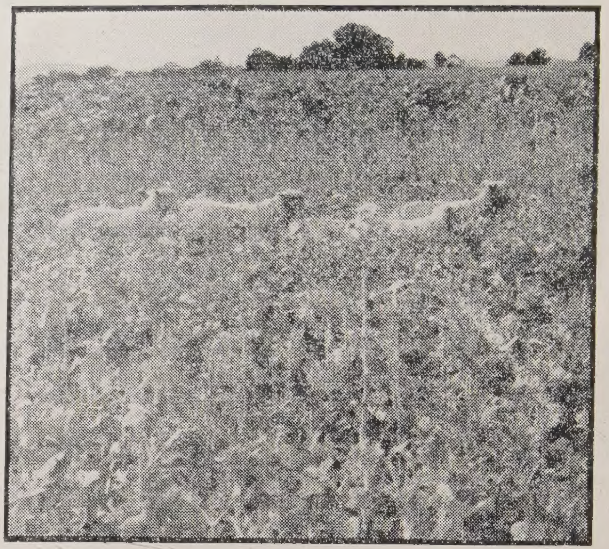
Where cattle ticks are plentiful spraying or dipping should be carried out in November and December to prevent tick worry and to kill the adult female ticks before they lay their eggs.

* * *

BLOWFLY STRIKE IN EWES

In districts where crutch strike causes trouble in ewes crutching or early shearing is advised. Close supervision is necessary to detect cases so that suitable treatment can be applied before the strike becomes too extensive. When treating cases of fly strike shear the wool away so that a 1in. margin of clean skin is left around the affected area. Remove the maggots by tapping with the shears and apply some reliable non-irritant dressing. Irritant fluids such as kerosene tend to cause restrike.

[*Sparrow Industrial Pictures Ltd. photo.*



SUPPLEMENTARY FEED

Supplementary feed is essential to ensure the proper feeding of cows in winter and in dry summers and to control facial eczema in autumn. As soon as more pasture is available than is necessary to meet the immediate needs of stock the balance should be shut up for silage or hay. On a well-managed dairy farm it should be possible to shut up at least 40 per cent. of the pasture. Crop growing for fattening of weaned lambs is standard practice in South Island districts and it could be adopted with advantage more widely in North Island districts which experience a dry summer. Crops such as thousand-headed kale and turnips, in addition to providing excellent fattening feed for lambs, are a splendid insurance against facial eczema. In Poverty Bay and Hawke's Bay they should be sown before the end of October so that they can be well established before dry weather sets in.

* * *

BLOOD POISONING AFTER SHEARING

Deaths after shearing may be due to infection of cuts or bruises with the blackleg germ. This disease can be prevented by vaccinating at least 3 weeks before shearing. If deaths have occurred in previous years, a Veterinarian or Inspector of Stock should be consulted with a view to arranging for vaccination this year.

* * *

GREENLEG IN BROODER CHICKENS

Greenleg occurs in poorly-ventilated brooders, especially if they are overcrowded and damp. At the first sign of trouble take necessary measures to ensure that ventilation is adequate and the litter is changed if it is at all damp.

Home Garden Work is Varied in October

By S. O. GILLARD,
Vegetable Instructor, Department
of Agriculture, Auckland.

THOUGH discretion is necessary in sowing or planting frost-tender subjects, October is one of the busiest months of the year for home gardeners. Damaging frosts can still be expected in South Island districts, but in northern districts frost-tender subjects such as tomatoes, egg fruit, pumpkins, marrows, pepper, cucumbers, squash, and kumaras can be set out toward the end of the month; if they are planted earlier or in colder localities, some protection such as hot caps, cloches, or wooden boxes with glass coverings will need to be given.

[Sparrow Industrial Pictures Ltd. photo.

TO secure a succession of salad vegetables plantings should continue at intervals throughout October. In districts where there is little likelihood of late frost seed of half-hardy vegetables such as dwarf and runner beans, melon, pumpkin, squash, and cucumber can be sown out of doors in warm positions. Successional sowings of peas, carrots, beetroot, lettuce, spinach, and turnips can be made. Plants of silver beet, lettuce, cabbage, and cauliflower can be set out and further plantings of second-early and main-crop varieties of potatoes can be made. Chokos, which are suitable for growing only in the North Island, should be set out without further delay, as these vegetables require a long season of growth. In the South Island the first planting of brussels sprouts can be made if the plants are large enough; it is not too late to plant asparagus.

Preparation of the ground for successional sowings and plantings should be continued and the soil made ready for the planting of pumpkins, marrows, etc. Early-planted potatoes should be moulded up as they grow to prevent wind or frost damage. Regular sprayings will be necessary to prevent late blight infection.

To avoid unnecessary consolidation of the soil by walking on it after planting and to save valuable time later, supports for tomatoes and runner beans can be placed in position and the ground worked up and prepared for planting. Earlier-sown peas will need moulding up and supports provided to prevent their coming in contact with the soil; hedge clippings which have a number of small branches but no foliage are ideal for this purpose.

Attention should be given to earlier-sown crops of beetroot, carrots, turnips, silver beet, and parsnips. These will require thinning and hoeing.

Where plants are not to be transplanted but are to remain in the bed until required for use it may be necessary to thin them somewhat; this part of the work should be done as soon as the plants are large enough to pull and before they begin to "draw" or become spindly from crowding. When thinning the rows of seedlings in the garden the best plants should be allowed to remain, but due consideration should be given to proper spacing. Failure to thin plants properly will invariably result in the production of an inferior crop.

Cultivation

Growing crops should be kept frequently hoed, and crops such as cabbage and cauliflower should have the soil drawn up to them to help support the roots. Root crops such as carrots, onions, and parsnips and small-leaf crops like lettuce and spinach need the soil level and with a free tilth.

The primary object of cultivation is usually weed control, but it also assists materially toward the conservation of moisture in the soil and the retention of plant nutrients by preventing leaching, particularly of valuable nitrates. In addition, it increases aeration of the soil, which will accelerate the rapid absorption of heat and will create for the plant a more favourable environment for its development.

No work is as beneficial to the growth of a vegetable plant as frequent light cultivation.

Liquid Manure

Cauliflower, cabbage, and lettuce plants nearing maturity will benefit from frequent applications of liquid animal manure. If the soil is of a clayey, wet nature and extra moisture would be a disadvantage, a side dressing of nitrate of soda at the rate of 1oz. to 6 plants is preferable. Care must be taken that the fertiliser does not come in contact with the stems or foliage of the plant; it should be worked lightly into the soil.

Beans

There is a very wide range of bean varieties, 72 distinct varieties being known. Those recommended are:—

Dwarf: Early: Pale Dunn and The Prince. Main crop: Tender Green, Black Valentine, and the butter or wax varieties Sure Crop, Golden Wax, and Bountiful Wax. Late: Sydney Wonder (semi-dwarf). Boston Bountiful, a main-crop dwarf variety, is not suitable for cooking as a green bean, but when dried is an excellent winter haricot.

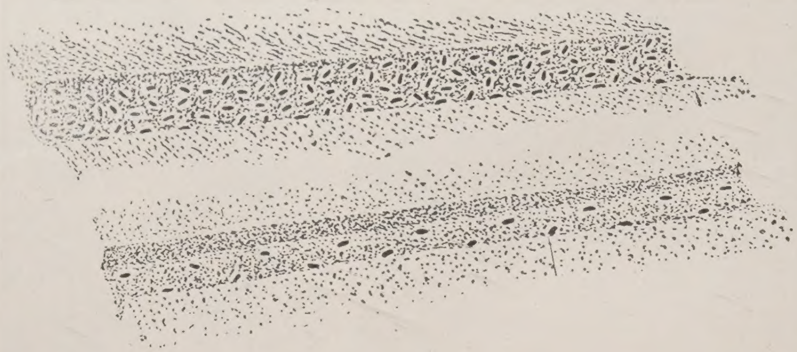
Tall or climber: Fardenlosa and Market Wonder.

Perennial runner: Streamliner and Improved Scarlet Runner.

All bean pods are green when they are small, but some turn white, yellow, or lose their colour as they approach the edible stage. Yellow types are called wax beans. The distinction between the tall and dwarf types is that the tall varieties send up tendrils with sinuous, twining stems. Tall varieties are usually later than dwarf types and bear for a longer period where climate permits and some produce larger pods. All varieties except broad beans are frost tender and require warm conditions for germination and growth.

Scarlet runner is a perennial and is undoubtedly one of the hardiest of its kind. It differs from the annual climbing bean in that its roots thicken, and in well-drained soils where winter conditions are not too severe the thick, fleshy roots will shoot again each spring, usually when frost danger is past.

THE HOME GARDEN IN OCTOBER



Trenches for beans should have square sides to ensure that seeds are sown at an even depth. The beans should be staggered in even rows and not sown thickly. Upper—Unsuitable trench and wrong method of sowing. Lower—Correctly-made trench and right method of sowing.

Beans can be grown in a wide range of soils, but well-drained, easily-worked loam of good humus content is most satisfactory. Wet, cold soils and low-lying situations should be drained or the plants grown on ridges where their roots are not likely to be subjected to excess moisture, which may cause the plants to become yellow and die.

Beans are frost tender and succeed only during the warm period of the year; a spell of cold weather or extreme changes in the temperature may adversely affect the pollination of the flowers and the subsequent setting of the crop. Lack of moisture at the roots during a spell of dry weather is also a frequent cause of non-setting of the flowers; it is partly for this reason that sandy soils or soils lacking in humus should be avoided unless a supply of moisture can be assured. Either a cold snap or exceptionally-hot or -dry conditions may cause the young bean pods to curl or hook or even to wither and die.

For the growing of beans the ground should be well dug, and a dressing of carbonate of lime (¼lb. per square yard) should be applied if a previous dressing has not been given. All leguminous plants require lime and yield their best only when this constituent is present in the soil. Provided the soil is moderately rich in available organic material and nitrogen, the only fertiliser required is a light dressing of superphosphate (¼lb. per square yard) worked into the top 4in. of the soil.

In the North Island an early sowing of climbing beans may be made from the middle of October onward according to locality. Perennial climbing beans do best if supplied with humus. To provide this dig a trench 9in. deep and about 1ft. wide, fill it to within 4in. of the top with compost or well-decayed animal manure, and cover it in with soil. The seed should be planted in a single row by being pushed into the soil on top of the trench to a depth of 2in., a 12in. space being allowed between each seed. If seed is planted too thickly, there is not sufficient room for root development, and poor yields result.

Climbing beans are best grown on supports and when any have attained a height of 3ft. the terminal shoot should be pinched off; this retards growth sufficiently to induce flower buds nearer the base of the plant. Most varieties of climbers will continue to bear until retarded by frosts if the pods are gathered regularly and before they develop large seeds.

To ensure continuity of supply it is usually advisable in most districts to make more than one sowing of dwarf beans. They take about 7 to 9 weeks to develop edible pods, compared with about 10 to 12 weeks by most climbing varieties.

Bean seed should be sown 1 to 2in. deep, but in exposed positions or on soils that tend to dry out a drill 2 to 3in. deep should first be drawn out and the seed pressed 1 to 2in. (according to whether the soil is heavy or light) in the bottom of it. Dwarf beans can be sown in single rows or double rows 4 to 6in. apart, with 2ft. to 2ft. 6in. between rows. Seed should be sown or thinned 2 to 4in. apart; the richer the soil, the greater the distance should be.

Annual climbing beans require supports; these may consist of a wire-netting fence, preferably 6 to 8ft. high, the seed being set 6 to 8in. apart in a single row on each side of the netting and 5in. out from it. Alternatively they can be supported by wooden stakes 6 to 8ft. long placed in a double row and spaced 1ft. apart each way. The stakes are drawn together in pairs at the top and attached to a cross stake; two seeds are set, one on each side of the stake.

Another method and one that is useful for the utilisation of a spare corner is to place four stakes 7ft. long 2ft. apart each way to form a square and to draw the tops together wigwam fashion and tie them; three seeds are set to each stake.

Lima Beans (*Phaseolus lunatus*)

There are two types of lima beans—dwarf and tall. A good dwarf variety is Burpee's Bush and a satisfactory tall variety is King of the Garden. The botanical differences between lima and common beans are not great, but the two types are not cross-compatible. Lima beans are shelled before cooking or are dried for winter use and have a characteristic flavour found in no other beans. Their culture is the same as that of french beans, but it is often advisable to sow the seed a little later, even though the beans require a longer time to mature. They are more sensitive to cold than even french varieties and succeed only in districts where favourable conditions are experienced for at least 4 months.

Edible Soy Beans (*Soya hispida*)

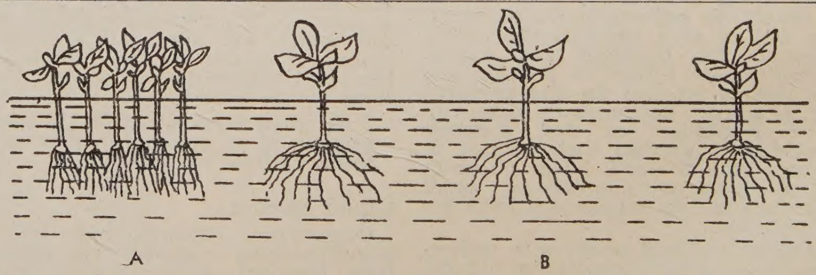
Good varieties of edible soy beans are Bansei, Kabott, and Giant Green. Their culture is similar to that of the bush lima bean, but as they are more tolerant of cooler conditions, plantings can be made earlier. Like the lima, they require a warm, moderately-rich soil. The pods can be shelled and the seeds cooked like broad beans or used dry in the same way as haricot beans. If they are used in the dry state, they are best soaked overnight before use. The soy bean is the most nutritive vegetable of the bean family; it has a high protein and fat content and also a high vitamin content.

Beetroot

Beetroot is a valuable vegetable, as it is fairly easy to grow and is a good source of vitamins A, B_1, and B_2. Though it can be stored, it is best when used young.

Early sowings often have a tendency to run to seed before full development, but the loss of part of the crop is insignificant if a successional sowing of one of the globe varieties has reached a usable size. A variety that matures quickly and is excellent for October sowing is Derwent Globe.

Beetroot can be grown in almost all types of soils and should, if possible,



Effect on growth of planting bean seeds too close together. A—Plants overcrowded without proper room for development. B—Vigorous growth resulting from correct spacing of the seed.

follow a leaf crop such as lettuce or cabbage. Where the ground has been previously heavily manured a dressing of superphosphate at the rate of ¼lb. per square yard and worked into the top 3in. of soil is all that is required. Beetroot is very sensitive to soil acidity, and lime is usually necessary on soils not recently dressed. On such soils a dressing of carbonate of lime (3 or 4oz. per square yard) worked in some time before sowing is satisfactory.

Sow the seed thinly in rows 12in. apart and thin the seedlings out to 3in. apart in the rows. When thinning be careful to "single" the plants, as generally two or more grow from the same seed vessel.

Good varieties are Derwent Globe, Obelisk, and Early Wonder.

Cabbage and Cauliflower

Cabbage and cauliflower plants of a good size which have been raised from seed sown earlier can be set out 18 to 24in. apart in the rows, with a 24 to 30in. spacing between the rows. Soil should be well prepared and a mixture composed by weight of 2 parts of blood and bone, 1 part of sulphate of ammonia, and ⅛ part of sulphate of potash should be distributed at the rate of ½lb. to each 6ft. along shallow furrows in which the plants are set out. To avoid danger of the fertiliser burning the roots of the plants it should be well mixed with the soil.

Good varieties to plant now are:—

Cabbage: Enfield Market and Golden Acre.

Cauliflower: Early London and Veitch's Autumn Giant.

Carrots

The growing of carrots, one of the most important vegetables in the home garden, should not be overlooked. They are easy to grow, especially where the carrot rust fly is not prevalent; they are very rich in vitamin A, a good source of vitamin B_1, and contain some vitamin B_2 and vitamin C. They have a long period of availability and maturity periods which vary from 65 to 100 days. There is no urgency yet to sow the main crop, and where the depredations of the carrot rust fly are severe infestation may be lessened if the seed is sown in November or December.

Ground that has been heavily manured for a previous crop should be selected for the growing of this crop. If fertiliser must be used, it should consist of equal parts of bonedust and superphosphate, but fresh manure must not be used, as this causes the roots to fork. Sow the seed in drills ¼ to ½in. deep and 12in. apart, and when the seedlings are well above the ground thin them out to 3 to 4in. apart.

Where carrot rust fly is troublesome the rows should be watered with D.D.T. 50 per cent. wettable powder directly after thinning. It should be applied at the rate of ½oz. to 4 gallons of water and in sufficient quantity to penetrate the soil to a depth of 1in. or more; where necessary further monthly applications should be made.

Recommended varieties are:—

Early planting: Earlykrop and Early Horn.

Main crop: Chantenay and Manchester Table. Intermediate and Nantes are suitable for main crops in deep soils.

[*Sparrow Industrial Pictures Ltd. photo.*

Carrots do best on land that has been well manured for a previous crop.

Cucumber

Cucumbers are distinctly a warm-weather crop. They may be grown during the warmer months over a wide part of New Zealand, but their large-scale production is mainly confined to the north. In districts where early and late frosts occur production is uncertain, but in some favoured localities they can be produced outdoors for 4 months of the year.

They are easy to grow if a warm, sunny spot is available, and as they are heavy yielders, a few plants will supply most needs and will help to give variety in most gardens. Cucumbers are frost tender and are very sensitive to cold soils; therefore they should not be planted in the open until the ground has warmed up. For an early crop seed may be started in small containers such as strawberry chips or punnets or pots under glass and replanted in the garden when soil and climatic conditions are right.

During early growth and in cool periods the plants may be covered with plant protectors such as cloches or hot caps. For transplanting the seed should be sown 3 to 4 weeks before planting out in the garden. Temperatures for cucumbers should be slightly higher than for most other plants raised in this fashion. The soil should not be watered too much, but just kept moist, and before planting out the plants should first be slowly subjected to the outside conditions.

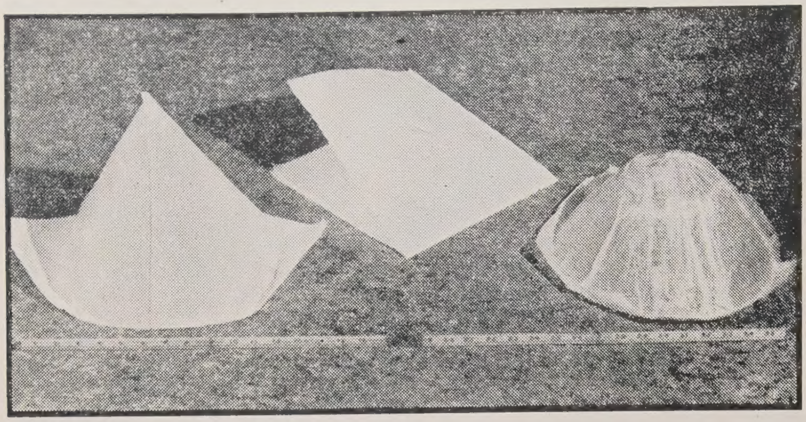
Cucumber plants replant best when the soil is not disturbed from their roots; if this is not possible, a sheet of newspaper placed over them when they are set out and held in position with soil and removed after 2 days will be an advantage. The cucumber requires a very fertile, free soil. For the home garden good results can be obtained by making a round hole 4 to 6in. deep and 1ft. 6in. wide in a warm, sunny, sheltered part of the garden, filling it with fermenting manure, replacing the dug-out soil, and levelling it on top of the manure, forming a round bed 4in. high with a flat top. Set several seeds round the edge of the bed, planting them ½in. deep in the soil. More seeds than the number of plants required are usually sown to provide against poor germination. The plants should later be thinned to four.

If the soil is inclined to cake, as in clayey soils, the seeds should be covered with a mixture of sand and soil or other material that will not harden and keep the plants from coming through. Cucumbers make rank growth and must have plenty of room; if a number of beds are required, they should be spaced at least 5ft. apart each way.

Good varieties are White Spine, Moneymaker Early Fortune, Davis Perfect, Short and Long Prickly, Crystal Apple, and West Indian Gherkin. The last named has very small fruit and is used entirely for pickling.

Kohl Rabi

Kohl rabi is grown for the turnip-like enlargement of the stem above the ground. It is cooked and served with white sauce in the same way as cauliflower and is an excellent vegetable if used while tender. It is easily grown and is a quick-maturing crop. It must be harvested when



[*Sparrow Industrial Pictures Ltd. photo.*

Hot caps may be made from white waxed paper ready cut to size, 23in. x 22in. The cap on the left is made by folding the paper into four and stitching up one side. The cap on the right is made from the same paper and is reinforced by two 4in. strips of similar paper placed crosswise from corner to corner and attached by running a hot iron over the whole sheet. This operation, beside attaching the strips, also warms up the waxed paper and makes it pliable for putting over a mould (an old car headlamp is suitable for this purpose). After it has been over the mould 1 or 2 minutes the cap is removed. For ventilation a hole 1in. in diameter is made in the side of cap.

between 2½ to 3in. in diameter. It is hardy and can be grown equally well in hot or in cool weather and usually does well if sown in October. It grows best in a soil that is well drained and rich in humus, and for most soils a mixture of 2 parts of blood and bone and 1 part of superphosphate applied at the rate of 3 to 4oz. per square yard will be found beneficial.

Seedlings may be transplanted, but seed is usually sown ½in. deep in rows 12 to 15in. apart and later the plants are thinned to 6 to 8in. in the rows. Kohl rabi should not be allowed to receive a check in growth through lack of moisture, as this causes it to have a bitter flavour.

Recommended varieties: Large Green and Large Purple.

Kumaras

Kumaras (sweet potatoes) will succeed only in localities where no frosts occur for a period of 5 months, and in the South Island, except perhaps in the northern districts, they can rarely be grown to maturity. The plants for setting out in October or November are usually raised by starting last season's tubers into growth by placing them in a hotbed or in soil in a glasshouse. When the rooted shoots are a few inches long they are planted a few inches apart in good compost soil in seed boxes or trays placed in cool frames or in a sheltered situation to develop further. Rooted cuttings from tubers started in late August should be ready for setting out in late October or early November. Most home gardeners prefer to purchase plants which are available at planting time from seedsmen or nurserymen in districts where this vegetable can be grown.

Kumaras will grow in almost any well-drained soil, but prefer a warm, sandy or volcanic type that is not too deep and with a fairly hard subsoil. The application of farmyard or stable manure or any nitrogenous fertiliser to the land immediately before planting is not recommended; land that was well manured for a previous crop is ideal. If fertiliser is applied, it should consist of a mixture of equal parts of bonedust and superphosphate plus 10 per cent. of sulphate of potash. This should be sown in a 12in. band along the row on the surface of the soil and the soil drawn up over it, forming a ridge about 6in. high and 15in. wide with a slightly-flattened top. The quantity of the fertiliser used depends on the fertility of the soil, but a general dressing is ½lb. to 4 yds. of row. All manure should be applied as a base dressing, because side dressings encourage the roots to spread and the tubers to form too far out from the row.

When conditions are favourable the plants may be set out on a warm day 16in. apart. Care should be taken to bend the root of each plant and to cover it to the same depth as it was in the nursery bed. The bending of the root to form a letter J, with the tail under the ground, is important, as it retards the sap flow from the root to the leaves, causing better tuber development and heavier cropping than result from perpendicular planting. After-culture should always be shallow and is confined to weed control and occasional raising of the vines to prevent rooting at the nodes. If they are allowed to become attached to the soil, they make heavy top growth at the expense of the tubers.

Two good varieties are Tauranga Red and the common native variety.

Lettuce

Lettuce should be grown in every home garden; it thrives best in cool, fertile soils, and if suitable varieties are chosen, it is possible in most home gardens to harvest them the year round. Plant breeders have produced varieties that have shown remarkable adaptation to hot, dry conditions, and by so doing have now made it possible to produce this valuable salad crop at the time of the year when it is most appreciated.

Any rich soil is suitable for the growing of lettuce. The plant is sensitive to the lack of lime, and if the soil is inclined to be acid, ½lb. of lime per square yard should be applied. For best results the soil should be built up with humus by adding compost or well-rotted manure. Fresh stable manure or undecomposed material should not be dug into the soil just before setting out plants, but should be first rotted down and applied some time beforehand.

Quick growth is essential to produce crisp, tender heads, and if growth is slow, they are liable to be tough and have a bitter taste. A fertiliser with a heavy proportion of nitrogen, such as blood and bone, broadcast at the rate of ½lb. per square yard after digging and before planting should give good results. Just before the plants begin to heart nitrate of soda applied between the rows (it should not come in contact with the plant stem or foliage) at the rate of 1oz. per square yard and worked lightly in will promote continual growth. Weekly applications of liquid animal manure may be used instead of nitrate of soda.

Seed is best sown thinly ¼in. deep in rows 6in. apart in a seedling bed and the plants transplanted out when

[*Sparrow Industrial Pictures Ltd. photo.*

A hot cap being removed from the mould.

they are about 3in. high. For a continual supply seed should be sown every 4 weeks.

Suitable varieties for sowing or planting in October are: Great Lakes, Neapolitan (Webbs or New York), and Imperial No. 847. Parish White is a suitable variety of cos-type lettuce.

Peas

Peas favour reasonably cool weather conditions and grow best in well-drained loam soils with a good humus content. For most soils a dressing of superphosphate at the rate of 2 to 3oz. per square yard worked into the ground before sowing is all the fertiliser necessary. Peas are best sown 1 to 2in. deep and about 2in. apart each way in double rows in the bottom of a trench. They should be earthed up later as for potatoes and produce better-quality pods if supported. A pound of seed is sufficient to sow about 100ft. of row.

For sowing now good varieties are Greenfeast, Stratagem, W. F. Massey, and Quartermaster; the last-named variety grows to a height of 3ft. and should be supported. For a regular supply varieties with similar maturity periods may be sown in succession or several varieties which have varying maturity periods, such as W.F. Massey, Greenfeast, and Quartermaster, may be sown at the same time.

Parsnips

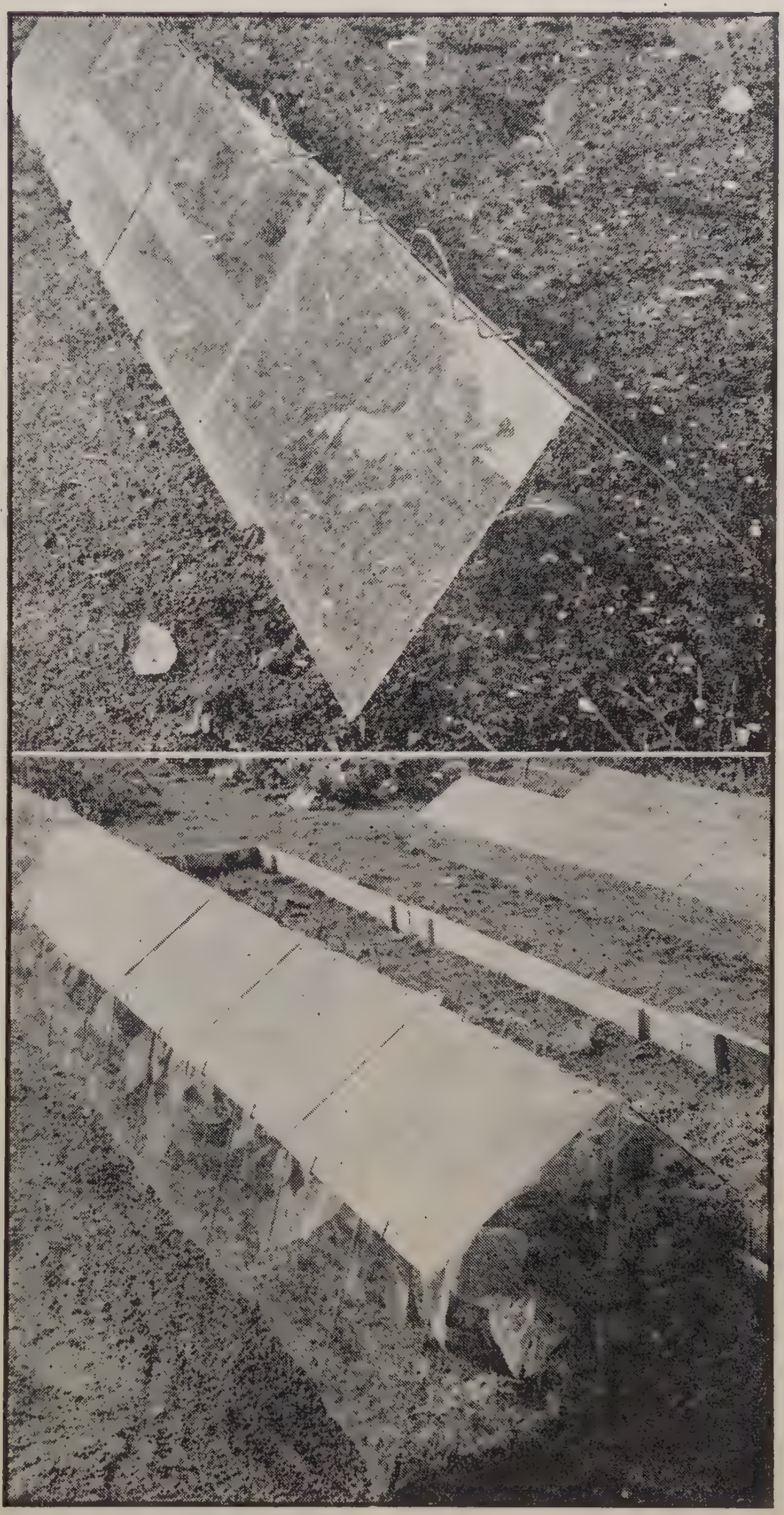
As parsnips require a long season of growth, and are required mainly for late-autumn or winter use, seed should be sown without delay. Parsnips grow well in almost all soils where vegetables can be grown, and best results are obtained if they are sown on land that has been heavily manured for a previous crop. Before seeding, superphosphate at the rate of 2oz. per square yard and, if available, dry wood ashes broadcast over the ground and raked in will benefit the crop. To ensure a good stand parsnip seed should be sown fairly thickly ½in. deep in rows 18in. apart in soil that has been worked down to a fine tilth. Later the plants should first be thinned to 2 or 3in. apart; final thinnings can be used in soups or stews. Half an ounce of seed will sow 100ft. of row. Hollow Crown is the best variety.

Potatoes

Yields of potatoes may be increased by the use of Government Certified seed, which is relatively free from disease. Certified seed is sold by seedsmen almost everywhere and the cost is only slightly above that of seed that has been grown without inspection or certification.

Any good, well-drained garden soil is suitable for potato production. An artificial fertiliser mixture of 3 parts of superphosphate and 1 part of sulphate of ammonia may be applied at the rate of 6 to 12oz. to 6yds. of row, or equal parts of superphosphate and blood and bone can be used. Either cut or whole tubers may be planted. In preparing seed potatoes it is desirable to cut them into "blocky" rather than wedge-shaped pieces. If good seed is scarce and high priced, cutting

TYPES OF CLOCHES



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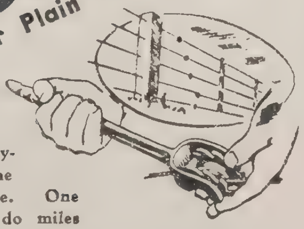

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potatoes into single-eye pieces may be satisfactory, provided the seed-bed is specially prepared and the conditions for growth are satisfactory. It should be remembered that the smaller the size of the seed piece the more necessary it becomes to have the growing conditions as favourable as possible. A trench 4 to 5in. deep is drawn out, the fertiliser is dusted along it, and the tubers are set 10 to 16in. apart. The soil is then drawn back over them, forming a shallow ridge or mould.

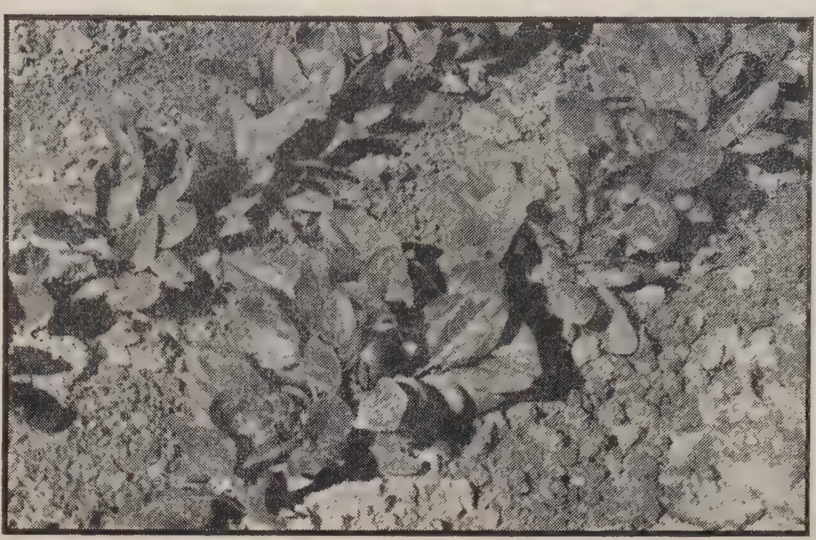
Recommended varieties for October planting are Arran Chief, Aucklander Short Top, King Edward, Inverness Favourite, and Security.

Salsify

Salsify is very adaptable and may be grown in practically all parts of New Zealand. It is very similar to parsnips in its requirements, but needs a slightly-longer growing season. It can be sown thinly in October or November in rows 12 to 15in. apart and later thinned to 4 to 6in. in the rows.

Half an ounce of seed will sow a 50ft. row and this should meet the requirements of most families. As salsify seed retains its vitality for only 1 year, fresh seed should always be used. Salsify may be left in the ground over winter or lifted and stored like other root crops. This fine vegetable should be grown more generally.

The best-known variety is Mammoth Sandwich Island.



[*Sparrow Industrial Pictures Ltd. photo.*

Spinach should be grown quickly to stimulate development and to produce crisp, succulent growth.

Spinach, Silver Beet, Spinach Beet, and N.Z. Spinach

Spinach, silver beet, spinach beet, and New Zealand spinach, though different in habit, are similar in their culinary uses. New Zealand spinach is not related to common spinach. It thrives in hot weather and is grown chiefly as a substitute at seasons when the ordinary spinach cannot withstand the heat. New Zealand spinach thrives on soils suitable for common spinach. Because of the larger size of the plants it must be given more room to develop.

As soon as danger of frost is past seed may be sown 1 to 1½in. deep in rows 3ft. apart and plants later thinned to 2ft. apart in the row. As some difficulty may be experienced in getting the seeds to germinate promptly, they should be soaked for 1 or 2 hours in water at 120 degrees F. before being planted.

Of the common spinach there are two varieties: Round Seeded for summer growing and Prickly Seeded for winter.

Seed may be sown thinly ½in. deep in rows 12in. apart and the plants later thinned to 3in. apart before they crowd in the rows.

For summer growing in warm districts silver beet (Swiss chard) is most commonly grown, as it is available for use over a much longer period than spinach. There are about six varieties, but the Dark Green and Light Green are the best. At this time of the year seed should be sown thinly ½in. deep in rows 18 to 20in. apart and the plants thinned to 9 to 12in. apart in the rows. If desired, seedlings may be transplanted.

Both spinach and silver beet should be grown quickly to stimulate development and to produce crisp, succulent growth so desirable in these vegetables. The soil should be well drained and contain plenty of organic manure. Blood and bone worked in at the rate of 4oz. per square yard can also be applied, and an application of nitrate of soda at the rate of 1oz. per square yard half-way through the growing period will be advantageous. This fertiliser should not be allowed to come in contact with the plant.

These crops will not tolerate an acid or sour soil, and if any doubt exists in this respect, the soil should be treated with an application of carbonate of lime at the rate of 2 to 3oz. per square yard before sowing.

Sweet Corn

In the home garden sweet corn forms an ideal shelter border for the more tender vegetables and is not without decorative effect. Sweet corn

[*Green and Hahn Ltd. photo.*

New Zealand spinach thrives in hot weather and is grown chiefly as a substitute for ordinary spinach when spinach cannot withstand the heat.

is a heat-loving plant, and therefore the hotter the summer temperature and the more sunshine it receives the greater are its chances of success. Because of this it is doubtful whether it can be grown successfully in parts of the South Island south of Mid-Canterbury, but elsewhere it generally grows quite well. Provided the soil is rich in humus, good crops can be produced on a wide range of soil types. Irrespective of district, the time of sowing is governed by the weather, but mid-October to mid-December is generally satisfactory, and if successional sowings are made, they will give a continuous supply in most districts from January until June.

Soil that is deficient in humus can be built up by a heavy dressing of compost or stable manure or a green cover crop such as blue lupins dug in sufficiently early to allow it to rot down.

If farmyard manure is not available, a dressing of blood and bone at the rate of about 1lb. to 12ft. of row, together with a liberal dressing of wood ashes, should give good results.

Sweet corn can be grown in either "hills" or drills in rows 3ft. apart. It is well to plant the seed 6in. apart and when the plants are 4in. high to thin them to 12in. apart or place three plants to each 3ft. hill. If suckers (shoots coming from the base of the plant) are removed later, better-quality cobs generally result. After-cultivation should consist of shallow hoeing and removal of weeds, and the banking of soil against the base will help to keep the plants upright.

Good varieties are Golden Bantam (79 days to maturity), Narcross (76 days), Golden Sunshine (74 days), Country Gentleman (95 days), and Stowells Evergreen (95 days). The number of days to maturity will give a guide to the home gardener in planting; several varieties can be sown at the same time to mature in succession.

Tomatoes

The tomato is easily one of the six most important garden vegetables. It grows under a wide range of conditions, requires small space for a large production, and its value in the diet is considerable. It is one of the richest sources of vitamins A, B, and C.

Because it originated in tropical America, the tomato requires a rather high temperature, but in localities where frosts do not occur for a period of 5 months and where the soil is fertile and has sufficient moisture the home gardener can grow tomatoes satisfactorily if a few precautions are adopted.

Though tomatoes may be planted out in late October in most northern districts, it will not be safe, except in a few favoured areas, to begin planting outside in most southern districts until the middle of November without incurring frost risk.

Enough plants for the home garden may be grown in a small cool frame and should be started 7 to 8 weeks before they are needed. However, most gardeners prefer to purchase plants; these should be stocky and well grown and about 6 to 8in. high and free from disease. If the plants are healthy and have been properly hardened off, the foliage should be an unblemished dark green and the base of the stems dark purple.

Hardening off is done by subjecting the plants gradually to conditions similar to those they will have when planted out. If bought plants have a very tender appearance, it is advisable to harden them off at home if the weather is uncertain.

Soil should have been deeply dug previously and the plot selected should be well drained and in a warm, sunny, sheltered position. Soils with a high humus content produce best crops, but if stable manure or a cover crop such as lupins or mustard has been dug in, it is important that it should have thoroughly decomposed, as tomatoes do not transplant well into soils which are kept too open and springy by the presence of considerable quantities of partly-rotted material. Before planting broadcast along the row in a band 12in. wide a fertiliser mixture consisting of equal parts of superphosphate and blood and bone plus 5 per cent. of sulphate of potash at the rate of 8oz. to 6ft. of row and mix it into the top 4in. of soil. If a good supply of wood ashes is available, it can be used instead of sulphate of potash.

Dwarf varieties will not necessarily require support, but will produce better-quality fruits if they are prevented from coming in contact with the soil. A good method for supporting dwarf tomatoes is to place 18in. wooden pegs at intervals 12in. out from plants along each side of a row and drive them into the soil to a depth of 6in. and attach 1in. by 1in. wooden slats on top. The plants as they grow can be trained and tied to the supports. Dwarf varieties require more space than tall and should be planted 3ft. apart, with the rows 4ft. apart. If tomatoes are to be pruned and trained to stakes, the plants may be set out 2ft. by 2ft. or 18in. by 3ft.

In localities where late blight, stem-borer caterpillar, and looper caterpillar are prevalent the plants should be protected from the time of planting by spraying them at 10-day intervals with Bordeaux mixture prepared from 4oz. of bluestone and 5oz. of hydrated lime in 4 gallons of water plus 2oz. of lead arsenate powder. Instead of lead arsenate ½oz. of D.D.T. 50 per cent. wettable powder may be used.

Good dwarf varieties are Tatura Dwarf Globe and South Australian Dwarf Red. Recommended staked or tall varieties are Potentate, Best of All, Market King, and Supreme.

A DANGER TO COMMUNICATIONS

[*P. and T. Department photo.*

FALLING trees and branches are the cause of most breakages to Post Office telegraph and telephone lines. Broken wires are a serious problem to the Post Office, because on four lines there may be 41 different actions taking place at the same time—3 "physical" voice conversations, 20 "carrier" conversations, and 18 telegraph messages being transmitted. Farmers and other rural residents, by trimming their trees clear of all wires, can prevent this danger to communications and can help to avoid many of the interruptions which occur.

SYSTEMS OF BREEDING POULTRY

POULTRY farmers interested in breeding frequently seek an explanation of the systems of breeding applied to poultry. These systems are described and evaluated in simple terms in this article, one of a series on breeding poultry by F. C. Bobby, Superintendent of the Poultry Industry, Department of Agriculture, Wellington. Following articles will discuss breeding programmes for egg production and describe the progeny testing of poultry.

FOUR systems of breeding are commonly used in poultry-farming—in-breeding, line breeding, out-crossing, and cross-breeding.

In-breeding

The mating together of related birds—for example, a brother and sister or a sire and his daughters—is known as in-breeding. The closest form is between a full brother and a full sister.

The effect of in-breeding is to intensify the characters in the birds mated—that is, to "fix" these characters—but it is just as easy to fix undesirable characters as desirable ones. Therefore in-breeding, particularly between closely-related birds, must be used with care in a breeding programme and should not be used even on a limited scale unless accompanied by rigid selection. Birds showing weakness or other undesirable characters must be eliminated by culling. Close in-breeding in poultry leads to reduced hatchability of eggs and increased mortality among chicks during the rearing period.

Thus in-breeding may be used to fix or intensify desirable characters in breeding birds, thereby reducing the variations within the flock, whether measured in external characteristics or fecundity. Rigid culling against undesirable characters is essential, and the extent to which close in-breeding can be practised is limited if deterioration of the constitution of the stock is to be avoided.

Line Breeding

A form of in-breeding, line breeding is the repeated use of one bird in a mating programme for as many years as it is fit for the purpose. By this special form of in-breeding it is possible to intensify the inherent characters of a foundation male in a large number of progeny during a limited number of years. The success of this method depends largely on the selection of a high-quality male carrying as many desirable characters as possible and one which will transmit these characters satisfactorily.

The necessity for finding a male with the ability to transmit desirable characters cannot be emphasised too strongly.

These pullets are mostly White Leghorns and Black Orpingtons, but the presence of some marked birds indicates that cross-breeding has occurred. If the parent stock is sound, cross-breeding can result in increased vigour, egg production, and rate of growth, but the progeny of such a mating should never be used for breeding.

Out-crossing

In breeding practice out-crossing is the opposite to in-breeding. It is the mating of birds of one breed which have no known relationship to one another. Results from out-cross matings are more difficult to predict, and such matings may well lead to increased variation among the birds. Undesirable characters not apparent or recessive in the breeding stock may appear in the progeny.

However, in many instances out-crossing tends to increase vigour. The bringing together of two unrelated lines of blood may result in increased hatchability, viability of chicks, egg production, and improved constitutions in the stock generally. Knowledge of the two blood lines should be available before an out-cross is made unless the mating is to be a completely hit-or-miss affair.

Cross-breeding

The mating of birds of two different breeds is called cross-breeding. Bringing together unrelated birds differing widely in their genetical make-up leads to a measurable general superiority over the parent stock, usually referred to as "hybrid vigour." Such vigour often appears in the form of improved constitution, shown in a greater proportion of chicks reared and reduced wastage among mature birds compared with the parent stock on either side of the mating. Cross-breeding may also result in increased egg production and rate of growth during the first 2 to 3 months of life.

To obtain these possible benefits it is essential that sound and desirable stock be used on both sides of a cross-bred mating. Though less attention to breed characteristics and type may be necessary where first crosses are bred for egg production, there must be no relaxation regarding the constitutions and health of birds used on either side of a cross-bred mating. All too often poultry producers consider that birds of poor general quality are good enough for a cross-mating; that policy is short-sighted and uneconomic.

Progeny from cross-breeding should not be used for breeding because such birds are likely to vary extensively in type, colour, and economic value. Therefore, a poultry producer who wishes to use cross-breds for egg production or for sale must maintain two breeds on the farm or buy in male birds for one side of the mating. To some producers the maintenance of two breeds is a disadvantage.

In New Zealand White Leghorns and Black Orpingtons (or Australorps) are used extensively for cross-breeding. Cross-matings made either way are satisfactory, though the use of a White Leghorn male on Black Orpington females is recommended.

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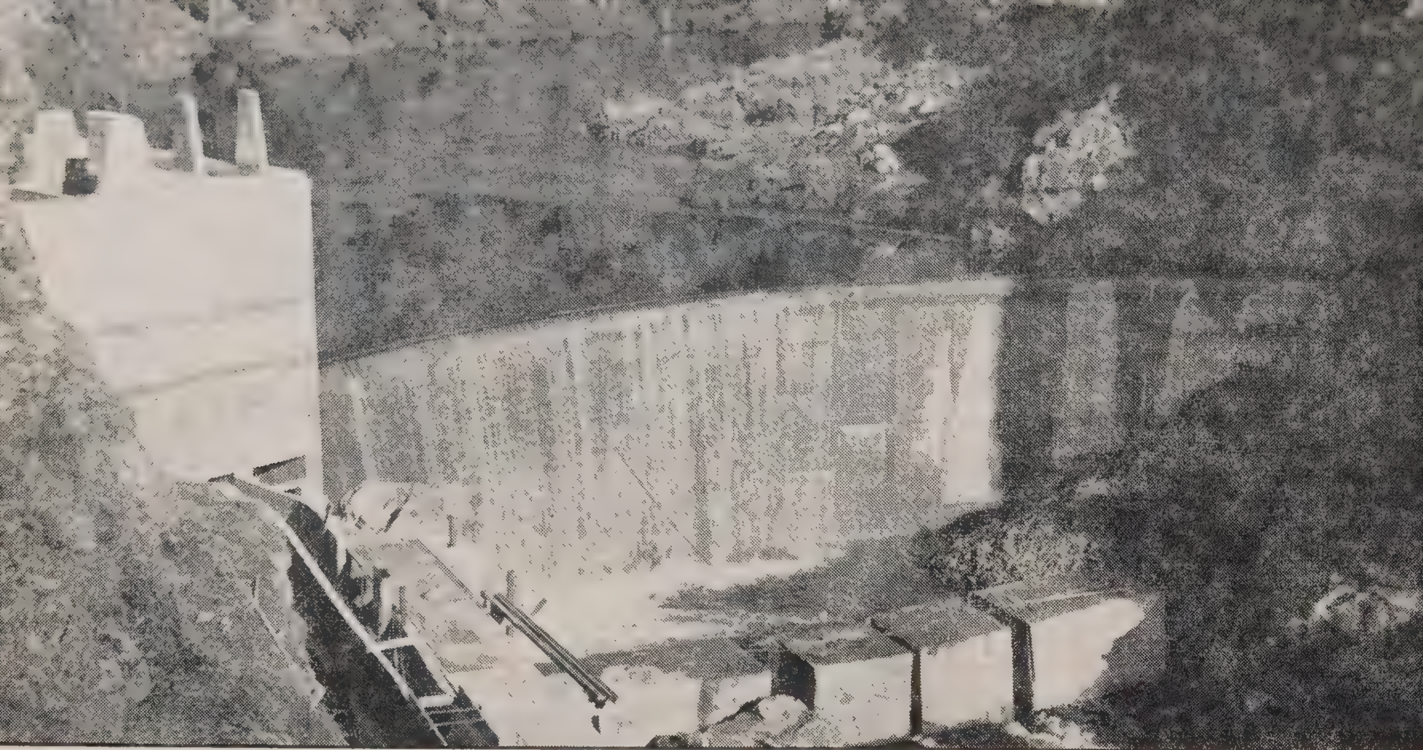


A PURE AND PERMANENT WATER SUPPLY

South Canterbury's Downlands Scheme

By H. A. ARTHUR, Department of Agriculture, Timaru.

THE Downlands Water Supply Scheme covers part of Geraldine, Levels, Mackenzie, and Waimate Counties in South Canterbury. This scheme is of enormous economic importance to many thousands of acres of downs country adjacent to Timaru which had no natural supply of water whatsoever. There were no permanent springs and practically no places where underground water could be tapped by sinking wells. The rainwater had to be conserved in tanks and dams. Farmers on the Canterbury Plains were served by water-races, the water being obtained from the Rangitata River, and nearer home the Levels Plains farms were watered by races supplied from the Opihi River; but the downs farmers had to rely solely on rainwater.

AS South Canterbury at times has spells of very dry weather (the rainfall at Timaru for 1935 was 20.0in.), and frequently drying north-west winds, these downs farmers dreaded drought periods. When very dry periods set in their creeks and dams gradually dried up. The rainwater tanks supplying the household needs contained less and less water until they were dry, and the farmer had to cart water from some permanent source often some considerable distance away. This entailed much loss of valuable time, as some work was left undone until a supply of water for the house was assured. Meanwhile the dams were getting lower and the creek holes drying up.

The farmer was then faced with the problem of driving stock at regular intervals to some permanent water in the district, and most likely he had to sell a portion of his sheep to conserve enough water to keep the remainder of his flock alive. This was disastrous, as nearly everyone else in the district was in a like predicament, and the sheep were sold much below their value.

All farmers know that stock thrive during hot dry weather even on scanty feed, provided they have access to an ample supply of good drinking water. Hence the limiting factor to the carrying capacity of a farm is the water supply.

A system of watering a farm solely by conserving rainwater in tanks and dams was anything but ideal. The rainwater in the household tanks became fouled by refuse washed off the roofs and spoutings, and the dams, which were usually built in depressions, became reservoirs for all the stock droppings washed off the catchment area. They were frequently stagnant, scum-covered pools of evil-smelling water and were regular breeding places of stock worms and kept the property infected.

For many years the late Mr. T. D. Burnett, M. P. for the Temuka electorate, could see this limiting factor to production which faced the downs farmers. He knew that a permanent supply of water would solve the difficulty. With the late Mr. T. G. Beck, the then resident Public Works Department Irrigation Engineer at Temuka, he was the prime mover in interesting the farmers and Government in some scheme to further this end. The outcome was the birth of the Downlands Water Supply Scheme.

General Idea of the Scheme

Briefly, the object of the scheme was to tap a permanent supply of soft water in the foothills and pipe it to several reservoirs in the area. From these reservoirs the water would be delivered through deeply-laid pipes to farm troughs and domestic supplies.

A tremendous amount of preliminary work had to be done before the scheme could be commenced. First, the amount of water required by the human and stock population had to be ascertained and an absolutely permanent supply found in an accessible place.

It was estimated by numerous trials that 4 gallons per acre and 200 gallons per house per 24 hours would be required. (This supply has proved adequate.) The boundaries of the scheme had to be defined and the consent of the ratepayers within the boundaries obtained before work could begin. When this preliminary work was completed the surveying of the project was begun.

HEADING PHOTOGRAPH: The main dam in the Tengawai River.

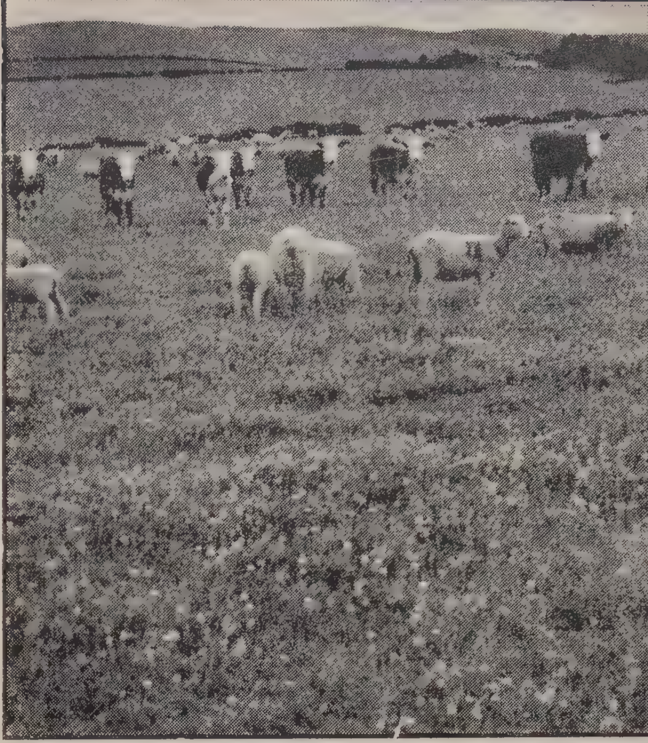
Sites for the intake and reservoirs were selected, main pipeline ditches were surveyed, and an accurate line and a boundary traverse flagged and pegged. This boundary traverse was the line above which it was impossible to deliver water. It may be of interest to note here that even after the scheme was in operation a number of farmers considered that the source of supply would prove to be inadequate, and there were many letters in the local paper condemning the intake site chosen. As time went on these pessimists were proved wrong, and the calculations of the engineers proved correct, as there has always been ample water available.

Farm Plans

One of the most interesting features of the draughting side of the scheme as far as the farmers were concerned was the farm plan. A complete series of aerial photographs of the whole area was taken and topographical features transferred from them to tracings of each survey block within the area. These tracings when completed showed boundaries of individual farms, all fences, wire and live, and physical features such as creeks, steep terraces, tracks, roads, plantations, etc. The scale of these tracings was 10 chains to the inch.

From these survey block tracings individual farm plans were printed and the work of the farm contact officer began. Starting at the farm nearest one of the reservoir sites, he would call on the farmer and, after going over the whole property, would plot on the farm plan and flag and peg on the ground the most advantageous trough positions. The basis of the scheme was to supply one free trough position to every 100 or part of 100 acres, and one free position to every homestead, the only cost of installation to be the actual trough and fittings and tank ballcocks at the domestic positions. Any extra domestic or trough positions could be arranged for the cost of the extra material used to connect these extras to a line joining two free positions. In most cases the best position for the trough was in the fenceline dividing two paddocks, preferably as near the centre of the fenceline as possible so that if at any future date the paddock was subdivided, very little material would be required to water the new subdivisions.

Trough positions in corners of paddocks were avoided as much as possible, as the crowding of stock into corners was detrimental to stock and fences. Much time and thought was given to placing the troughs in the most advantageous positions, consideration being given to future subdivisions, shelter, gradient, etc.



Provision of a clean and reliable water supply has enabled South Canterbury farmers to develop cattle grazing as part of their stock programme for control of grass in "growthy" seasons. This was not possible before the inception of the Downlands Water Supply Scheme.

Exemptions

Under the provisions of the scheme any land which was adequately watered by permanent springs, creeks, artesian wells, etc., could be exempted from the special water rates, and any domestic supply drawn from a permanent source could be exempted from the domestic rate. During the farm inspection the farmer indicated any paddock which he wanted exempted, and it was marked on the farm plan, with a note of the reason for exemption such as the presence of a permanent spring, creek, etc. Later a representative of the council of the county in which the farm was situated revisited the farm with the contact officer and a thorough inspection was made of the water supply; if the evidence showed that the supply was permanent and adequate to water the number of stock depastured on the paddock, the area was exempted from

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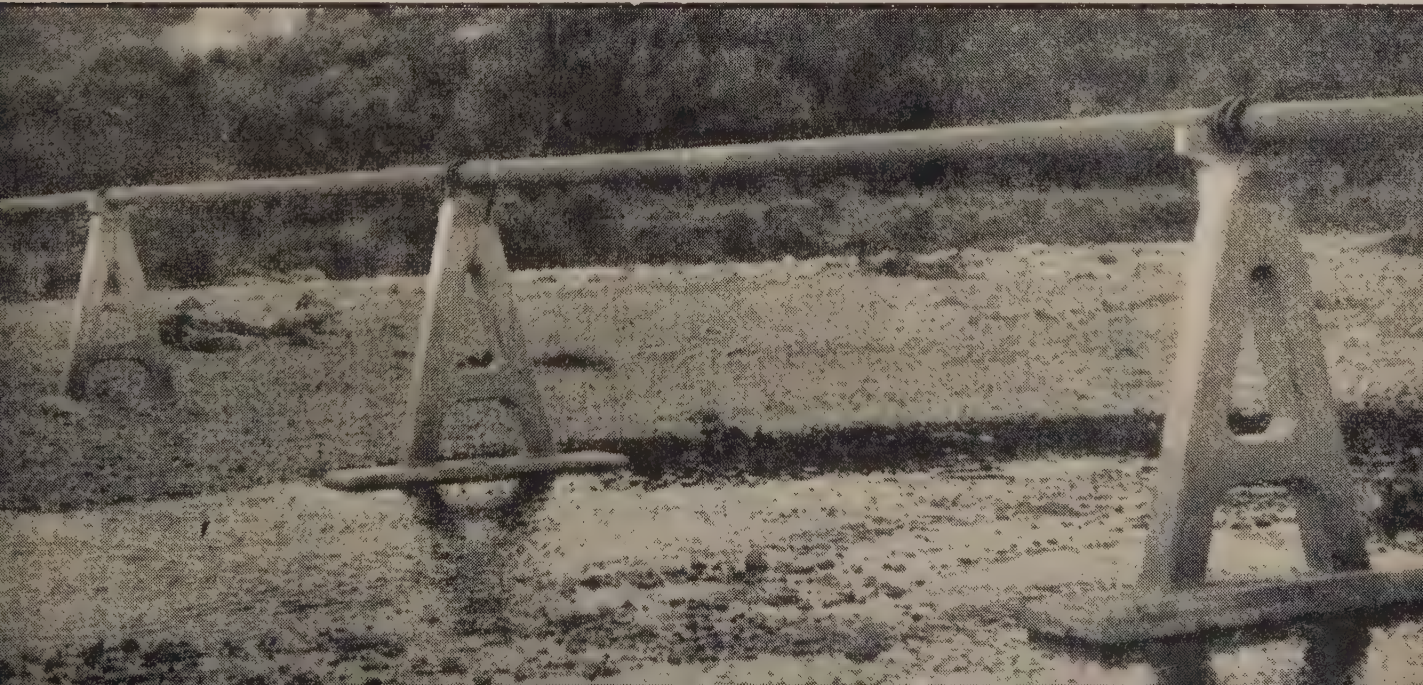
Below—The sub-main carrying water for the Pareora Dam crossing the Pareora River. Where mains or sub-mains had to cross rivers the pipeline was supported on high reinforced concrete pillars well above the highest flood level.



the water rate. Another ground for exemption was if land lay above the boundary traverse and it was therefore impossible to deliver water. Occasionally it was possible to deliver water to a corner of one of these high areas, and the farmer was granted exemption on part of the paddock and paid water rates on the balance.

Position of Feeder Lines

Each day the individual trough and domestic positions were marked on the large survey block plan and from the data shown the draughtsman worked out the positions, diameters, capacities, etc., of the required pipelines.

Agreements

When this work was completed another two copies of each farm plan were printed, showing the free trough positions, domestic positions, and any extras required, also the position of all pipelines going through the property. On the reverse side of the plan was the agreement between the Crown and the property owner to have the work done. It set out precisely the cost of each trough and the cost of all extras (see specimen plan and agreement on page 211). When this agreement was signed pipe pulling began and troughs were delivered to their respective sites.

(Incidental to the subject of farm plans, it would be of great assistance to Instructors in Agriculture in the Timaru district if farmers would keep their copies of their farm plans handy and mark on them any new areas of certifiable crops they have sown.)

Roadside Troughs

At regular distances and advantageous positions in each county roadside troughs were placed for the convenience of travelling stock.

TECHNICAL DETAILS OF THE SCHEME

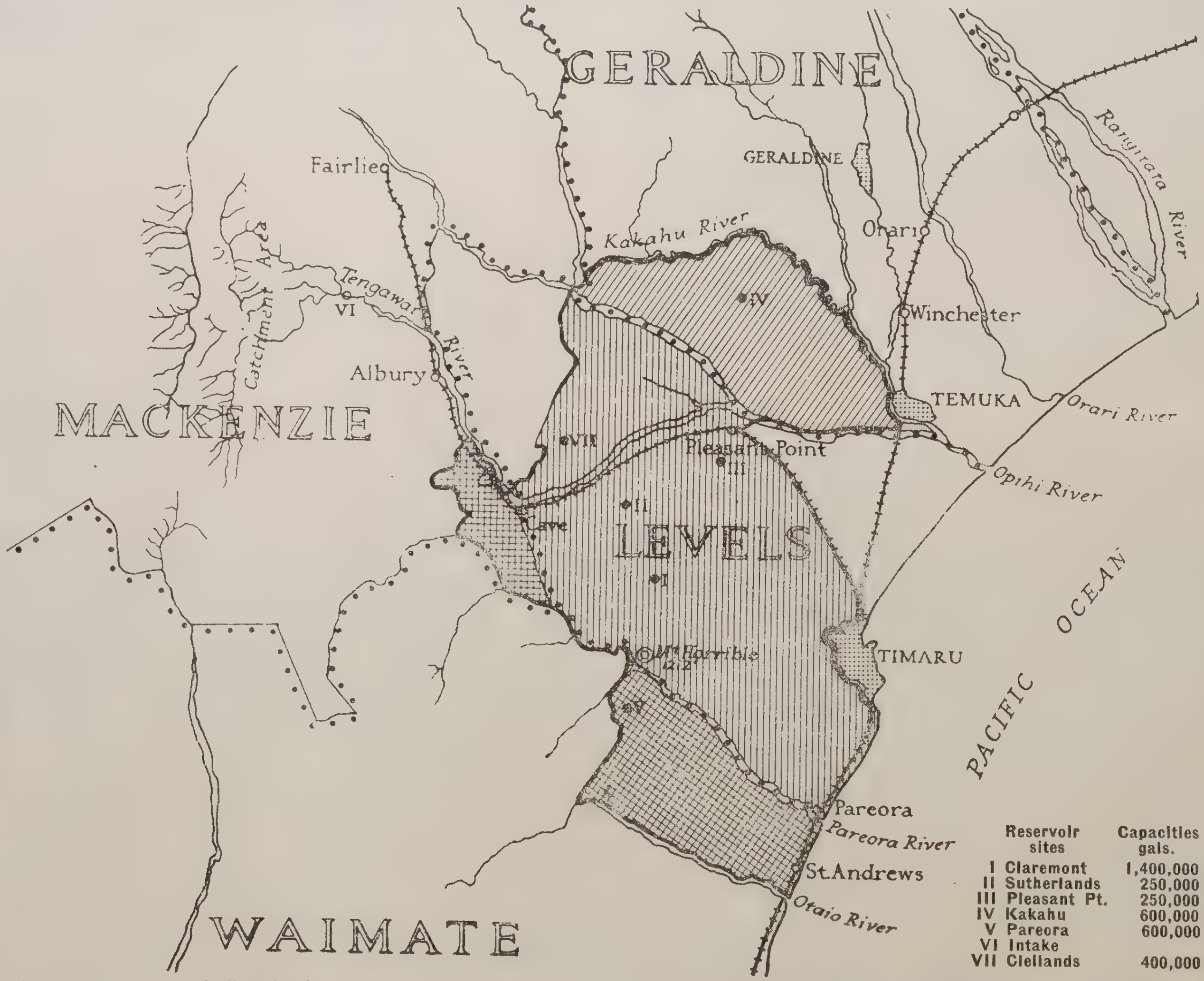
Catchment Area and Water Supply

The catchment area comprises some 42,000 acres of high country rising to an altitude of 3000ft. It is the watershed of the Tengawai River, which is fed by numerous mountain streams rising in bush-clad valleys and gullies.

This area receives an appreciable snowfall in the winter, which ensures a gradual run-off of water, and is situated in the belt of higher summer rainfall, so that an ample supply of water is always available.

The following is an analysis of a sample of the run-off water drawn from a Downlands Water Supply Scheme trough on a farm at Epworth

LOCALITY PLAN OF DOWNLANDS WATER SUPPLY SCHEME



Reservoir sites	Capacities gals.
I Claremont	1,400,000
II Sutherlands	250,000
III Pleasant Pt.	250,000
IV Kakahu	600,000
V Pareora	600,000
VI Intake	
VII Clellands	400,000

Area within the dark line is the gazetted area of the Downlands Water Supply Scheme. Different hatchings show the areas of the Levels, Waimate, Geraldine, and Mackenzie Counties within the gazetted area.

on March 4, 1946. This water travelled through pipes and reservoirs to one of the most distant troughs in the system. (Analysis results are expressed as part per 100,000.)

Smell when heated to 1000 degrees F.	faint
Chlorine in chlorides	0.25
Nitrogen in nitrates	trace
Nitrogen in nitrites	nil
Ammoniacal nitrogen from free and saline ammonia	trace
Oxygen absorbed in 4 hours at 80 degrees F.	0.039
Albuminoid nitrogen	trace
Total solids	8.6

Bacterial analysis of water taken from the same part as the chemical sample shows that the water is particularly pure, containing no impurities which would be injurious to the galvanised pipes, of which there are many hundreds of miles in the scheme.

The scheme gives the farmer soft water which lightens the housewife's domestic duties and ensures long life for electric and ordinary coal range hot-water systems.

The Main Dam

The main dam is of the weir type with concrete arch. It is 30ft. high and is situated below the Tengawai Gorge at an elevation of 1070ft. The illustration of the dam shows the lake which has formed behind it. The water flows to a concrete flume and thence through sand traps to the main pipeline.

Pipes

The main pipeline is 13in. in diameter. It is of concrete in places where there is up to 200ft. of head and of concrete-lined steel elsewhere. The mains carry water to the various reservoirs, whence it is delivered through sub-mains to the farm reticulation system, terminating in ¾in. galvanised pipes. The capacity of the mains is 856,000 gallons per day.

Pressures

Static heads are up to 700ft. in the mains and on supply lines. The pressure is governed not to exceed 250ft. head. Pressures are controlled through break-pressure tanks and pressure-reducing valves. If it were not for these, terrific pressure would be developed on the lower reaches of the lines and no taps or pipes would be able to withstand the pressure.

The break pressure tanks are a very simple means of reducing pressures. At every 250ft. of elevation of the sub-mains a cylindrical concrete tank is fitted. The flow of water into the tank is regulated by a large ball-cock; when the tank is full the ball-cock shuts off the inflow of water. The water flows away from the pressure tank at a reduced atmospheric pressure as it is used at the troughs and domestic supplies.

The diagram below shows how the system works.

There are approximately 700 miles of pipes laid in the scheme. These supply water to 135,600 acres and 960 houses, including the townships of Pleasant Point, Cave, Pareora, Gleniti, and St. Andrews. The township of Pleasant Point is supplied by its own reservoir, which has a capacity of 250,000 gallons and is situated on the downs above the township. This reservoir supplies 150 houses, several high-pressure points for watering gardens, etc., 74 fire hydrants, many troughs, and an ingenious supply at pig pens in the local saleyards. This supply allows pigs to be sprayed by a fine spray during very hot weather.

Reservoirs

Six reservoirs with a total capacity of 3,240,000 gallons have been built to command individual areas (see plan of gazetted areas for localities) throughout the scheme and to ensure approximately one week's reserve supply during floods and other unforeseen interruptions in the mains. These reservoirs are of concrete slabs lined with bituminous seal in expansion joints and have specially-drained foundations. Inlets are governed by by equilibrium float valves.

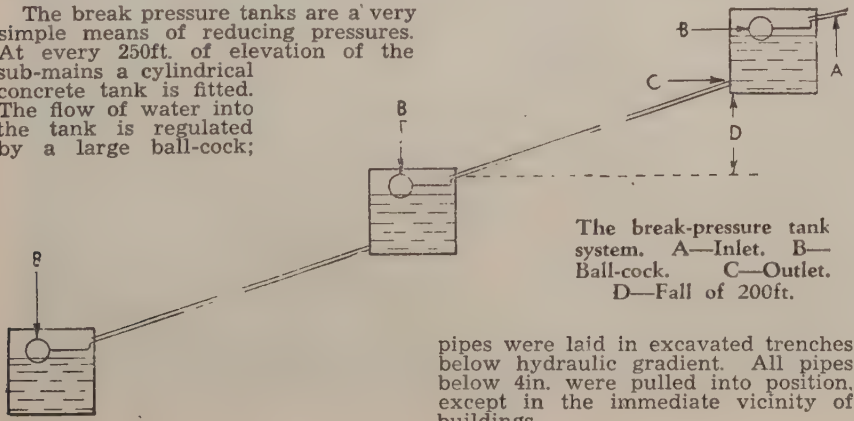
The reservoirs and their capacities and altitudes above sea level are:—

	Capacity gallons	Altitude ft.
Claremont	1,400,000	920
Sutherlands ..	250,000	900
Clellands ..	400,000	790
Kakahu	600,000	725
Pareora	600,000	785
Pleasant Point ..	250,000	450

These reservoirs supply water to numerous dips, high-pressure points, cowsheds, roadside troughs, etc., besides the 135,600 acres and 960 houses previously mentioned.

Pipe Laying

The mains are laid below hydraulic grade, either on benches prepared by bulldozers or in trenches excavated by machine. For sub-mains down to and including 4in. diameter, galvanised pipes were laid in excavated trenches below hydraulic gradient. All pipes below 4in. were pulled into position, except in the immediate vicinity of buildings.



The break-pressure tank system. A—Inlet. B—Ball-cock. C—Outlet. D—Fall of 200ft.

Pulling Technique

Pipes socketed on one end were delivered by trailer in advance of the pulling party. The pulling plant consisted of a crawler bulldozer pulling a rock rooter with one tine adapted for pulling a torpedo to which was attached by a fuse a socket suitable to the pipe diameter. A trailer with a mechanical screwing machine suitably mounted jointed the pipes as the bulldozer pulled the line at a predetermined depth and direction. A small crawler tractor maintained pipe supply to the pulling party. Each length pulled was coupled by long screws in an excavated trench and each section was tested by air pressure. The length of pipe pulled was dependent on the topography of the ground and the diameter of the pipe. Pipe of 2½in. to 3½in. diameter was pulled up to 300ft. on country without change of grade or direction; pipe of 2in. diameter was pulled up to 500ft. on country with only slight directional or grade change; pipe of 1¼in. to 1½in. diameter was pulled up to 650ft. on country with more defined changes; and pipe of ¾in. to 1in. diameter was pulled up to 1000ft. on all but fairly steep rolling downs. As practically all the land within the scheme was ploughable, great care had to be taken to ensure that the pipes were buried well below the greatest depth of ploughing, especially on faces where the tendency was for the soil to become shallower because of successive ploughings and erosion. All pipes in the reticulation were laid at a minimum depth of 1ft. 6in.

Some farmers feared that the disturbing of the subsoil by the pipe-laying plant, especially where pipes were pulled straight up long facings with a steep gradient, would be potential sources of washouts. The engineers overcame this danger by rolling above the pipeline with a heavy tractor. This method was very successful, as no washouts occurred, even though the rainfall in 1945 proved to be the heaviest in memory.

Laying Costs

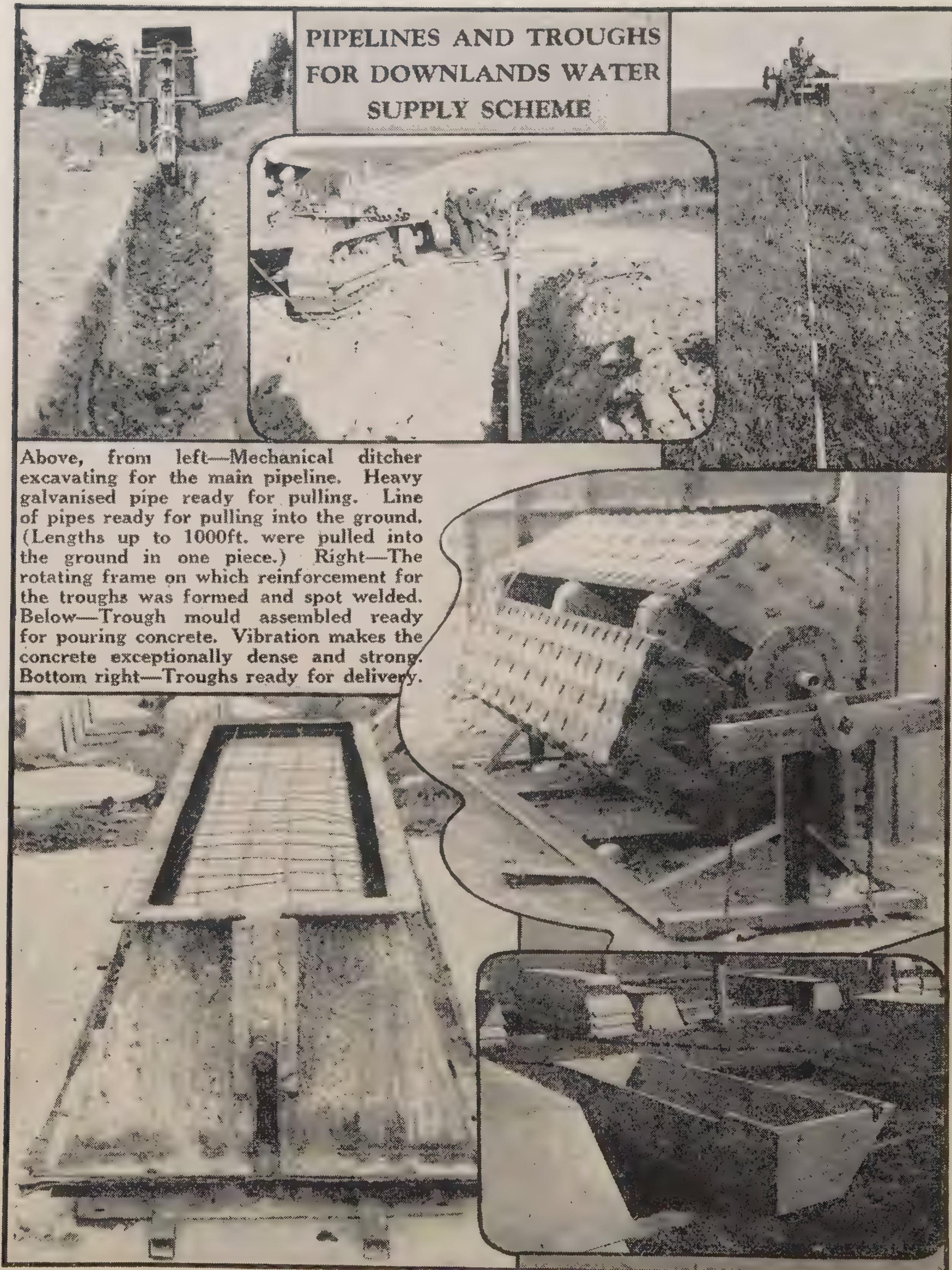
On such an extensive scheme the saving of a fractional part of a penny per foot of pipe must have marked effect on capital costs. Thus cost of the pulling technique was closely analysed and compared with hand labour costs, and the following analysis shows the total laid cost of pipes in 1939 in pence per foot.

TOTAL LAID COST OF PIPES IN PENCE PER FOOT

Size of pipe in.	Machine Labour cost d. per ft.	Machine Total cost d. per ft.	Hand laid Labour cost d. per ft.	Hand laid Total cost d. per ft.
¾ ..	0.48	5.459	2.03	7.009
1 ..	0.53	6.603	2.28	8.453
1¼ ..	0.57	8.823	2.55	10.803
1½ ..	0.62	11.201	2.81	13.391
2 ..	0.67	14.05	3.31	16.690
2½ ..	0.72	20.584	4.08	25.944
3 ..	0.78	25.127	5.12	29.467
3½ ..	0.84	32.550	6.25	37.960

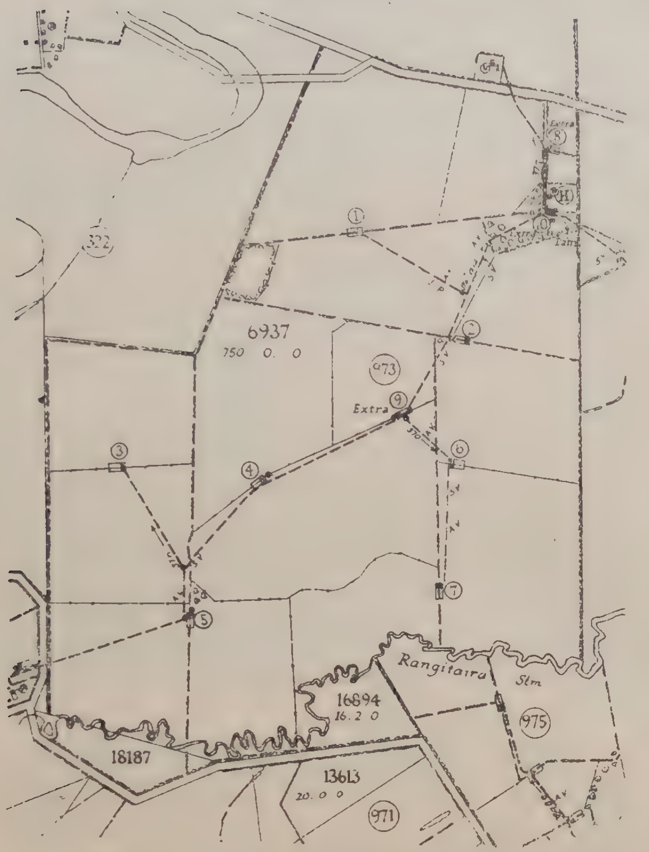
The table above shows that by using modern mechanical methods and utilising heavy earth-moving plant considerable capital expenditure was saved.

PIPELINES AND TROUGHS FOR DOWNLANDS WATER SUPPLY SCHEME



Above, from left—Mechanical ditcher excavating for the main pipeline. Heavy galvanised pipe ready for pulling. Line of pipes ready for pulling into the ground. (Lengths up to 1000ft. were pulled into the ground in one piece.) Right—The rotating frame on which reinforcement for the troughs was formed and spot welded. Below—Trough mould assembled ready for pouring concrete. Vibration makes the concrete exceptionally dense and strong. Bottom right—Troughs ready for delivery.

DOWNLANDS WATER SUPPLY SCHEME



No. 973 John Smith

Area: 608 acres 1 rood 29 perches

House supply at H

Troughs at 1, 2, 3, 4, 5, 6, 7

Extra troughs at 8, 9, and 10 (existing)

I hereby certify that I am the owner of the property shown on the plan on the reverse side of this sheet and I agree to allow the Public Works Department to place troughs and lay pipelines as indicated thereon and I agree that I am liable for all repairs to fences resulting from the placing of such troughs and I further agree to pay for all work shown as extra work on the said plan before such work is undertaken by the Department. The cost of the extra work is as follows:—

	£	s.	d.	£	s.	d
7 Concrete water troughs @	2	7	6	16	12	6
Extra trough at 8						
Connection to supply pipe		1	6			
Stop-cock in place		4	9			
¾in. pipe hand laid 8ft. @ 1s. per ft.		8	0			
Connection to trough, including ball-cock ..		12	6			
Concrete water trough in place	2	7	6			
				3	14	3
Extra trough at 9						
Connection to supply pipe		1	6			
Stop-cock in place		4	9			
¾in. pipe hand laid 8ft. @ 1s. per ft.		8	0			
Connection to trough, including ball-cock ..		12	6			
Concrete water trough in place	2	7	6			
				3	14	3
Extra connection to trough in yard No. 10						
Connection to supply pipe		1	6			
Stop-cock in place		4	9			
¾in. pipe hand laid 8ft. @ 1s. per ft.		8	0			
Connection to trough, including ball-cock ..		12	6			
				1	6	9
Owner to supply ball-cock cover to Department's approval				£25	7	9

Payable at P.W.D. Office, Temuka. If by cheque 9d. exchange must be added where necessary and cheque crossed and made payable to "Public Account only."

Owner. For Minister of Public Works

Date 2/9/40 Date 2/9/40.

Specimen farm plan (left) and agreement (right) showing free and extra trough positions, pipelines, etc.

The total cost of mains per foot was as follows:—

Diameter in.	s.	d
4	4	6.372
5	5	4.822
6	6	5.014
7	7	6.949
8	7	7.261
10	12	8.861
13	10	10
	to 13	5, depending on locality, pressure, and type of pipe.

Troughs

The troughs were manufactured in the factory erected at Pleasant Point for the making of special reinforced concrete for components used on the scheme. These troughs have a capacity of 60 gallons and are of exceptional strength, being reinforced with electrically-welded steel rods and webbing.

This reinforcing, made up on a form and welded into one unit, looked like a giant paper basket. The concrete was then consolidated round the reinforcing by vibrators and the curing was done in steam. A few farmers thought that one horse trough would prove insufficient to water a 6-horse team at the midday feeding time, as the draw-off would be very great when all the teams were unhitching at the same time. They therefore had two Downlands Water Supply Scheme troughs installed end to end, thus giving a double supply. This extra expense proved unwarranted, as the one trough supplied all the water necessary.

Finances

The total area of the scheme within the gazetted boundary is 137,635 acres. The cost of the scheme to date has been £336,956. The estimated cost to complete Waimate County is £17,940, giving a total cost of £354,896.

The capital expenditure was covered by Government loan and grant. The loan is being repaid by annual subscriptions from local bodies concerned. Their revenue is derived from rating on property in the area. This works out with some slight variations in different counties at 9d. per acre and up to £3 10s. per residence.

If a property was divided by a public road or thoroughfare, each portion was allocated trough positions on the basis of a position for every 100 or part of 100 acres. Thus a 10-acre farm with 5 acres on each side of the road was entitled to two free trough positions. Troughs were charged at £2 7s. 6d. per trough in place at each free position. Extra troughs were supplied at £2 7s. 6d. and all charges in connection with installation were recovered from the land owner.

Domestic supply was via a storage tank of varying capacity governed by a ball-cock. On metered supplies water was charged for at a certain rate per 1000 gallons and the meter unit was supplied at extra cost.

All piping above ground level leading to tanks and troughs was lagged with a felt material and finished on the outside with water proofed material, thus preventing all danger of the pipes freezing.

Conclusion

South Canterbury is a favoured farming district of New Zealand and the farmers there are generally progressive and successful. The farming of the area covered by the scheme has benefited appreciably by an assured supply of good water, irrespective of whether the season is one of those very dry ones that occasionally occur in Canterbury. In fact the Downlands Scheme is regarded by Canterbury farmers as being so successful that in certain districts, for example, North Canterbury, an extension of the scheme is being considered, even though the cost today would be much greater. These districts are ones which, mainly because of their contour, are unsuitable for the use of stock water-races drawn from the main rivers that are so common on the Canterbury Plains as well as on minor plains such as the lower Waitaki Plain and the Culverden Plain.

Acknowledgments

Acknowledgment is made to Public Works engineers and draughting staff at Temuka and to county clerks of the various counties for photographs and information.

Britain's Need of Increased Food Supplies

BRITAIN's efforts to maintain an adequate diet for her people by rationing foodstuffs on a basis of "fair shares for all" and her need of increased supplies of food were outlined in a recent radio talk by Dr. Norman Wright, chief scientific adviser to the British Ministry of Food. Dr. Wright came to New Zealand at the invitation of the Government and during his visit made investigations into means of increasing food production in the Dominion and aspects of research aimed at improving methods of storage and transport. Dr. Wright's talk, which made an appeal to New Zealand farmers to help ease Britain's food difficulties by supplying greater quantities of primary products, is printed below in a condensed form.

"AS you all know, during the war we had to increase very substantially our own home production of wheat and other field crops, while at the same time we were forced to limit our imports of livestock products from overseas owing to shipping and other difficulties. As a result our diet contained far more bread and other cereals, far more potatoes, far less meat, and far less dairy products than in pre-war years. It was plain, it was monotonous, but—as a result of the special steps which we took to improve its nutritive value—it was nourishing.

"The diet of our people was improved in another way—it was more evenly spread over the population. This even spread was achieved by subsidising the prices of all the staple commodities, thus making them available at low cost; by rationing all scarce foods on the basis of 'fair shares for all'; by allotting special supplies of the more nutritious foods like milk and eggs to what we call the vulnerable groups, that is, to infants and children, to invalids, and to expectant and nursing mothers; by providing special school meals for children attending our day schools; and by allocating larger rations to industrial workers, particularly to those working in the heavy industries, whose needs for high energy foods are especially great, through the large-scale establishment of industrial canteens.

"Since the war we have been faced with at least equally difficult problems in maintaining our food supplies at an adequate level, partly because of the general world food shortage and partly because of our special dollar problems. But the good work has gone on. For instance, before the war only half our children took advantage of our milk-in-schools scheme; now over 90 per cent. do so. Before the war only 150,000 school meals were served daily in our elementary schools; now the figure is not less than 2½ million. Before the war industrial canteens were the exception; now there are more than 28,000 such canteens, while many workers to whom canteen facilities are not available can obtain special allowances for packed meals. Where foods have remained scarce rationing has been continued, and the policy of subsidies on staple foods has been maintained (with slight adjustments) to ensure that supplies continue to be available on the basis of 'fair shares for all'.

Lowered Death-rate

"The results of this unique system of nutritional planning speak for themselves. The death-rates from those conditions which are commonly affected by malnutrition have fallen to record low levels. Clinical surveys show that the nutritional condition of children and adolescents is better than it ever was, while the healthy appearance of our babies and infants is the subject of comment by many visitors from overseas. The growth-rates of our children, too, are higher than ever before. And if the children of a nation are in good fettle, the future of the nation is assured. We are not letting food shortages stand in the way of good health.

"But we have been able to ensure this only at a cost, and the cost is a serious reduction in the palatability and variety and attractiveness of our diet and a very real strain on the ingenuity and often on the patience of the housewife. Consider for yourselves the problem with which she is faced. What could you do if you had only 1½ to 2oz. of bacon* and only 10 to 12oz. of meat to draw on for the whole of your week's meals? And if your cheese and fat and sugar and tea were rationed (and, like us, you are great tea drinkers in New Zealand) and if your supplies of both eggs and milk were severely limited?

"What, then, can New Zealand do to help us? Your farmers have already made a splendid effort in raising the exports of mutton and lamb; your own self-sacrifice in maintaining butter rationing and prohibiting the sale of cream has gone far toward preserving our small 3oz. butter allowance;* to many of you we owe a debt of gratitude for your gifts of food parcels and for conserving and sending to us supplies of fat which might otherwise be wasted. But in your own interests as well as Britain's do not allow these achievements to let you rest on your oars."

Expanding Market for New Zealand Produce

Dr. Wright went on to say that never before had there been such a market open to New Zealand in the United Kingdom and he quoted consumption figures of four products, meat, butter, cheese, and dried-milk powder to illustrate this point.

Meat: Before the war the quantity of meat consumed annually per head of population in Britain had been 110lb.; it was now less than 70lb. In comparison, New Zealanders ate over 200lb. British beef supplies were down from 55lb. per head annually to less than 40lb., bacon from 27lb. to less than 10lb., and pork from 12lb. to only 1lb. Because meat was the British housewife's greatest need, Britain had agreed to take all New Zealand's exportable supplies for such a long contract period and hoped that the farmer would be able to increase the output of beef, mutton, lamb, and pig meat.

Butter: British pre-war annual consumption of butter had been 25lb. per head (31lb. in New Zealand); the amount available now was 12½lb. Butter was the housewife's second priority and the market for New Zealand's exports was doubly assured, for not only were total supplies less by 50 per cent. than the pre-war intake, but Britain was unlikely to be able to manufacture butter in any considerable quantity.

Cheese: The annual consumption of cheese per head in Britain before the war had been 9lb. Though the level of consumption had risen to over 14lb. during the war, limited supplies had caused a fall to 8½lb.

Dried-milk powder: During the war nearly 3½lb. of dried-milk powder had been available per head a year to supplement the supply of liquid milk; the supplies were now limited to only ½lb. per head a year.

"You will see that there is a market for dairy products of all kinds in Britain, not only a market for your present supplies but an expanding market for the extra supplies which we hope to get under the recently-negotiated long-term contract," continued Dr. Wright.

"I do not want you to think that we are sitting back ourselves, and asking you to do the work. Never before in her history has Britain set herself such a target for her own agricultural production—no less than an increase of 50 per cent. over the pre-war output.

British Farmers' Target

"Our farmers are responding splendidly; already we are nearly two-thirds on the way to achieving our target. That target is, however, chiefly devoted to foods which will not compete with yours—bread grains and other cereals, milk, eggs, and to a less extent beef and veal. Thus your programme and ours do not conflict; they are neatly dovetailed to suit the interests and local conditions of production of our respective countries.

"Evidence of the British Government's interest and concern in New Zealand's food production is not only clear from the negotiation of our long-term contracts. We are endeavouring to the best of our ability to supply you with those industrial goods which are limiting the output of your fields. Already we have been able to ease the shortage of fencing wire, one of your farmers' primary needs; this year, although we are short ourselves, we are sending you no less than 30 per cent. of our entire output. We look to you therefore, and particularly to your farmers, and those engaged in processing their products, to join with us in a production drive which will bring not only increased food to the British people but increased prosperity to your country. . . ."

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* Since this broadcast was made the bacon ration in the United Kingdom has been raised to 3oz. per week and the butter ration to 4oz.

Farm Dairy Instruction: Care of Milk and Cream

By W. G. Batt, Supervisor of Dominion Farm Dairy Instruction.

THOUGH the correct treatment of milk and cream before delivery to the manufacturing dairy will do much to retard development and multiplication of bacteria and avoid unsatisfactory flavours, it is essential that the utmost cleanliness of equipment and during milking is maintained to keep the numbers of bacteria to a minimum and to confine those present to the more satisfactory types.

CONTAMINATION of milk or cream between the time of its extraction from the cow and its delivery to the manufacturing dairy is chiefly from four sources:—

1. From unclean methods of hand milking or stripping;
2. Direct contamination through the milk or cream coming in contact with equipment improperly cleaned;
3. Indirect contamination, caused by the milk or cream absorbing the smell of unclean surroundings, manure heaps, unclean woodwork, concrete, etc., and
4. During transport, by the milk or cream being agitated in cans improperly cleaned or of pitted and unsatisfactory metal.

Thorough cleanliness of the cow's teats and udder and the hands of the milker is essential in both hand and machine milking. As hand milking is frequently done into an open bucket, contamination from dust can be considerable, especially in milking sheds of the closed type and in those where hay and other fodders are fed to the animals. Any measures taken to reduce the prevalence of dust in and about the milking shed and milk room will bring an improvement in quality.

Cleanliness of Air Supply to Shed

Equal in importance to the cleanliness of equipment is the cleanliness of the air supply to the milking shed, milking machine, cream separator, or milk cooler. An air supply impregnated with dust or affected by the unclean smell of insanitation will cause very serious contamination both by air-borne bacteria and by absorption and its consequent taints. During the milking operation the intake of air by the milking machine is immense, and it is essential that it should be from a clean source, if possible from grassed surroundings.

Contamination of dairy produce by this means is very considerable, and especially during the summer months large quantities of milk and cream are affected. In many cases this is due to insufficient attention to the cleanliness of concrete and surroundings, but in a larger number the fault is due to an unsatisfactory layout of the dairy premises. Many concrete yards the exits from which are not concreted and fenced are arranged in such a way as to provide a permanent menace to quality, particularly where the prevailing wind carries contamination from these sources to the milking machine and releaser room. In no circumstances should the traffic of cows be allowed near the releaser room, and proper planning will provide against such a contingency.

Properly-planned Layout Essential

The objective in planning the layout of dairy premises is to provide against the possibility of contamination of dairy produce by unsatisfactory surroundings during the whole life of the milking shed, and this is simple if adequate attention is given to the fundamentals. A modern and properly-planned layout will ensure that the entry of stock to the concrete and their exit from it are confined to a distant point where the prevailing wind will carry dust and odours away from, and not to, the milking premises.

Figs. 1 and 2 show the front and back views of a walk-through milking shed in which the cows enter the concrete holding yards by a concrete race 8ft. wide and after milking are returned to this race and the grazing paddocks by an exit race 3ft. wide leading from the bails. The releaser room end of the shed is placed into the prevailing wind, ensuring that the air supply to the releaser and cooler is as clean as possible.

Heading photograph by National Publicity Studios.

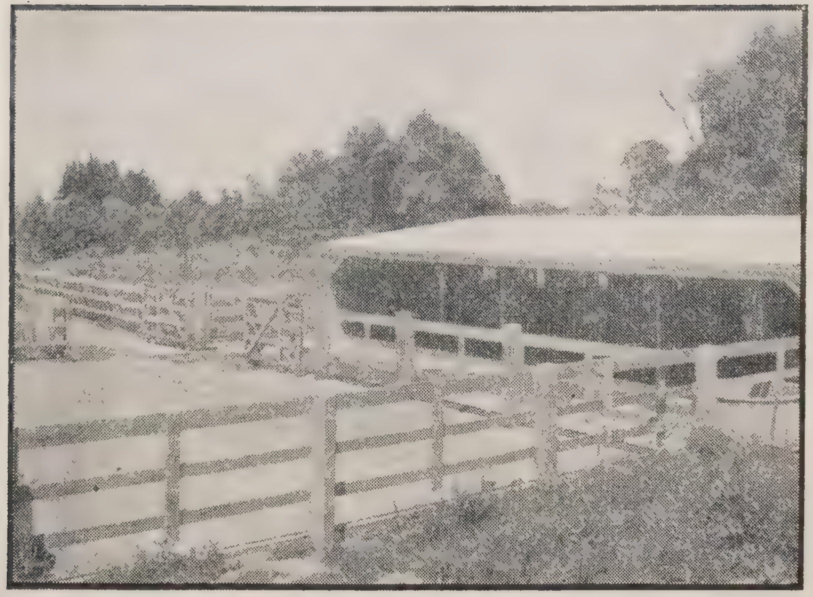


Fig. 1—The front view of a walk-through milking shed, showing a concrete entry race leading from the grazing area to a holding yard in front of the building.

With the exception of the concrete races, the whole surroundings are grassed, providing the utmost cleanliness of air. There is no mud or cut-up surroundings at such a shed, and the maintenance of good-quality produce from such a dairy is very materially assisted. The milking shed shown in Figs. 1 and 2 has no open drain, the drainage fall of the concrete being to the 8ft. entry race, from the end of which an open drain extends to a drainage sump.

Figs. 3 and 4 also show the front and back views of a walk-through milking shed in which the layout is arranged in conjunction with a central farm race which gives access to and from each grazing paddock. The main concrete holding yard is placed at the end of the shed, and the herd of 160 cows enters this yard from the farm race and is taken to the crush yard in front of the bails as required.

As the cows are milked they are returned to the farm race by a concreted and fenced exit race 3ft. wide leading from the bails as shown in Fig. 4 and travel individually to the paddock intended for them. In this layout the concrete floors of the bails, exit race, and holding yards have one fall from the back of the race to the front of the yard, which is kerbed, and the only open drain leads from the front of the yard to the sump or cistern.

Here again, the area surrounding the shed is grassed, ensuring an air supply as clean as possible. There is no possibility of contamination from cut-up or unsatisfactory surroundings, and the only area from which dust can arise from the traffic of cows is at the farm race, but the risk of contamination from that source is negligible, because it is distant from the shed and arranged so that the prevailing wind carries dust away from the premises.

If proper consideration is given to essential and fundamental points, the provision of a similar layout is simple. Where the erection of new dairies is contemplated careful and proper planning should be made to achieve the objective of a clean air supply to the premises at all times. Such an arrangement is equally applicable to the internal-race type of milking shed.

Cooling of Milk

As milk intended for manufacturing is released by the milking machine or delivered from hand milking it should be cooled immediately to a temperature of 65 degrees F. or less or chilled by refrigeration. Surface cooling of milk and cream carried out in a clean atmosphere has special value, as it reduces animal heat and animal odour by aeration, and, more important, it reduces the temperature of the produce to a level at which bacteria do not develop rapidly. This class of cooling, however, is undesirable under unsatisfactory conditions and in fact may be harmful, as the greater exposure of the produce to an unclean air will provide additional contamination. Clean, fresh air is essential for aeration and cooling.

The cooling of cream as it leaves the separator has additional value, as its bulk or volume is contracted by cold and its consequent thicker consistency enables it to be transported with less agitation, which ensures better quality on delivery.

During summer, and particularly in districts with warm climates, there is considerable churning of milk and cream during transport to the manufacturing dairy. The condition is more pronounced in milk containing large fat globules, but is caused primarily by inefficient cooling or lack of cooling. Such a condition in milk or cream is unsatisfactory, as the churning makes it difficult to take a correct sample for butterfat testing, the quality is affected by oiliness, and generally a metallic flavour is imparted by the agitation of the produce against the warm metal. Faulty treatment of this kind is usually costly and can be corrected by efficient cooling, by filling the cans to a level which will reduce agitation, and by adequate covering of the transporting vehicles to protect the produce from the sun. During hot weather a cream of good consistency (40 to 45 per cent. fat) should be separated to ensure less agitation during transport.

Use of a Spreader

Whether milk is conveyed to the transporting cans mechanically or by hand, the use of a spreader which delivers an equal quantity to each container at the same time is an

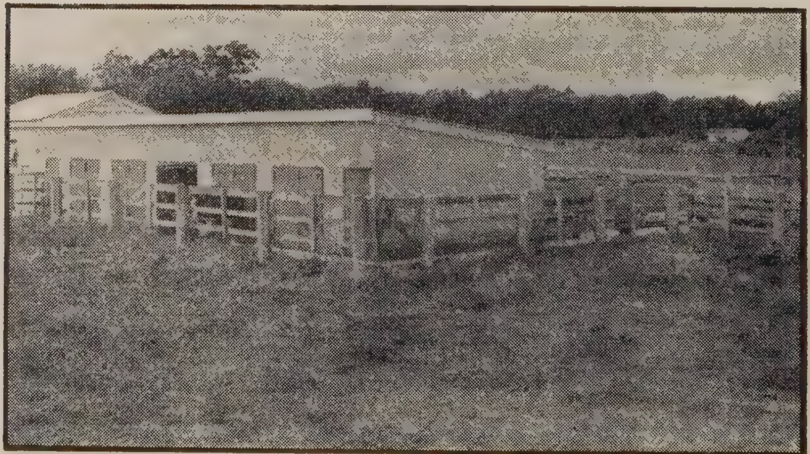


Fig. 2—The back view of the shed illustrated above, showing the 3ft. exit race connecting with the entry race for returning the herd to pasture.

advantage, as it provides a uniform quality and uniform fat content over each of the several cans.

Frequent stirring of milk with a metal plunger during the time it is awaiting delivery to the factory is essential not only to improve quality by aeration, but to ensure a uniform distribution of butterfat. The serum containing fat globules rises to the surface of milk in the form of cream fairly rapidly, and causes an uneven distribution of butterfat, making it difficult to take a representative sample for testing purposes. This is considerable in those milks containing fat globules larger than average. Where a pronounced layer of cream has formed on the surface of milk agitation during transport to the factory, especially in hot weather, may separate some of the fat from the serum, making representative sampling even more difficult and imparting an oily and metallic flavour. Judicious stirring of the milk while it is awaiting delivery retards the formation of cream on its surface, improves the flavour of the milk by releasing undesirable gas, and ensures a better distribution of butterfat.

If milk or cream must be kept some hours before delivery to the manufacturing dairy, it is again highly important that it should be kept in clean, fresh air. Generally the greater the circulation of clean air at the milking shed, milk room, or separator room, the better is the quality of milk and cream. The same applies most particularly where cream is not delivered daily to the manufacturing dairy, and it is essential that it should be kept under satisfactory conditions away from the milking shed. Each skimming of cream should be held in a separate container and each thoroughly stirred with a metal plunger before mixing and aggregating for delivery.

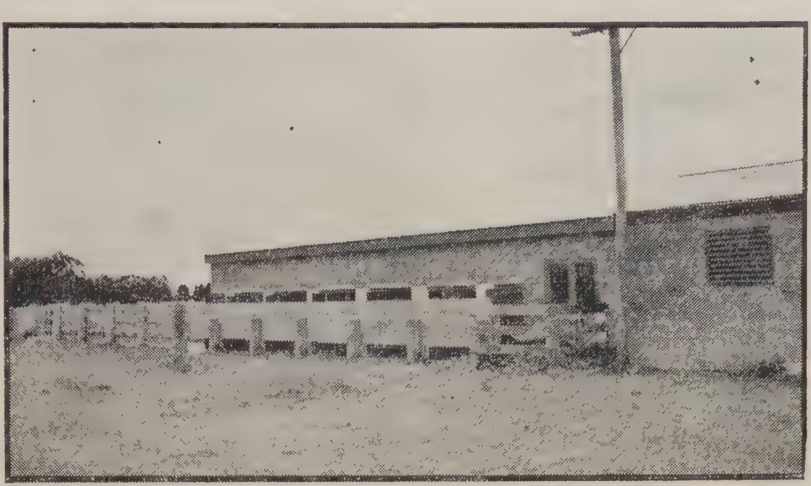


Fig. 4—The back view of the shed illustrated below, showing the 3ft. exit race returning past the yards to the central farm race.

Effect of Agitation

Broadly the more milk or cream is agitated against metal during transport the greater and quicker is the deterioration in quality, but this has greater application to milk or cream produced under unclean or unsatisfactory conditions. Though it is desirable and advantageous to have these raw products delivered to the manufacturing dairy as quickly as convenient and with as little agitation as possible, tests have shown that milk and cream produced under good conditions will not suffer if transport facilities are reasonable. Deterioration in quality during transport is greater in cans or vessels partly filled than in those that are completely filled, as agitation is more intense.

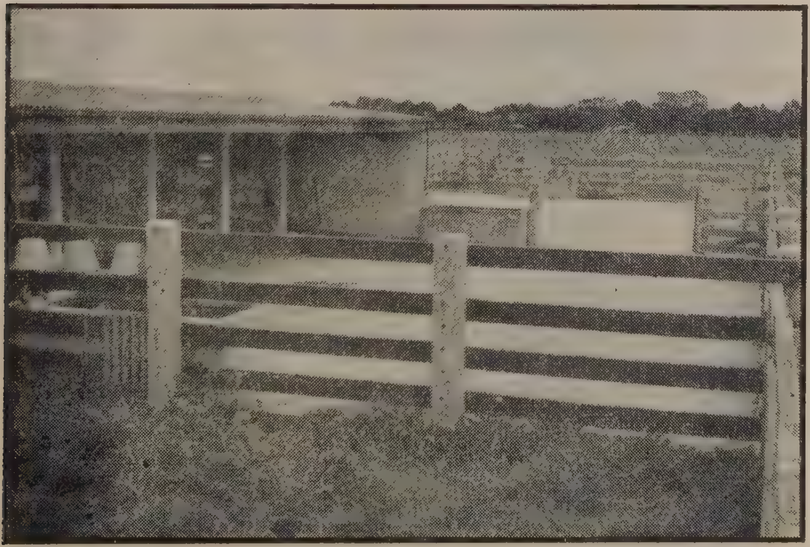


Fig. 3—A walk-through milking shed, showing the main holding yard at the end of the building and connected to a central farm race.

The production and delivery of milk and cream of consistently good quality are achieved best by observation of the following points:—

1. Ensuring that cows are not in a heated condition during milking, and encouraging habit forming to ensure the contentment of cows by the tranquillity of quiet regularity.
2. Insistence on the utmost cleanliness of teats and udders of cows and the hands of milkers.
3. Observing and maintaining the utmost cleanliness and sterilisation of all dairy equipment.
4. Ensuring that all metal used in dairy production is in good condition and properly tinned and that all rubber has a good inside surface.
5. The provision and maintenance of a clean air supply to the dairy premises and provision against airborne contamination.
6. Using an efficient cooling system.
7. Spreading the milk over each of the several cans.
8. Frequently stirring with a metal plunger all milk awaiting delivery.
9. Holding the milk and cream in clean, fresh air before delivery.
10. Keeping each delivery of cream separate and by stirring with a metal plunger before aggregating.
11. Not mixing warm and cold cream.
12. Reducing agitation during transport.

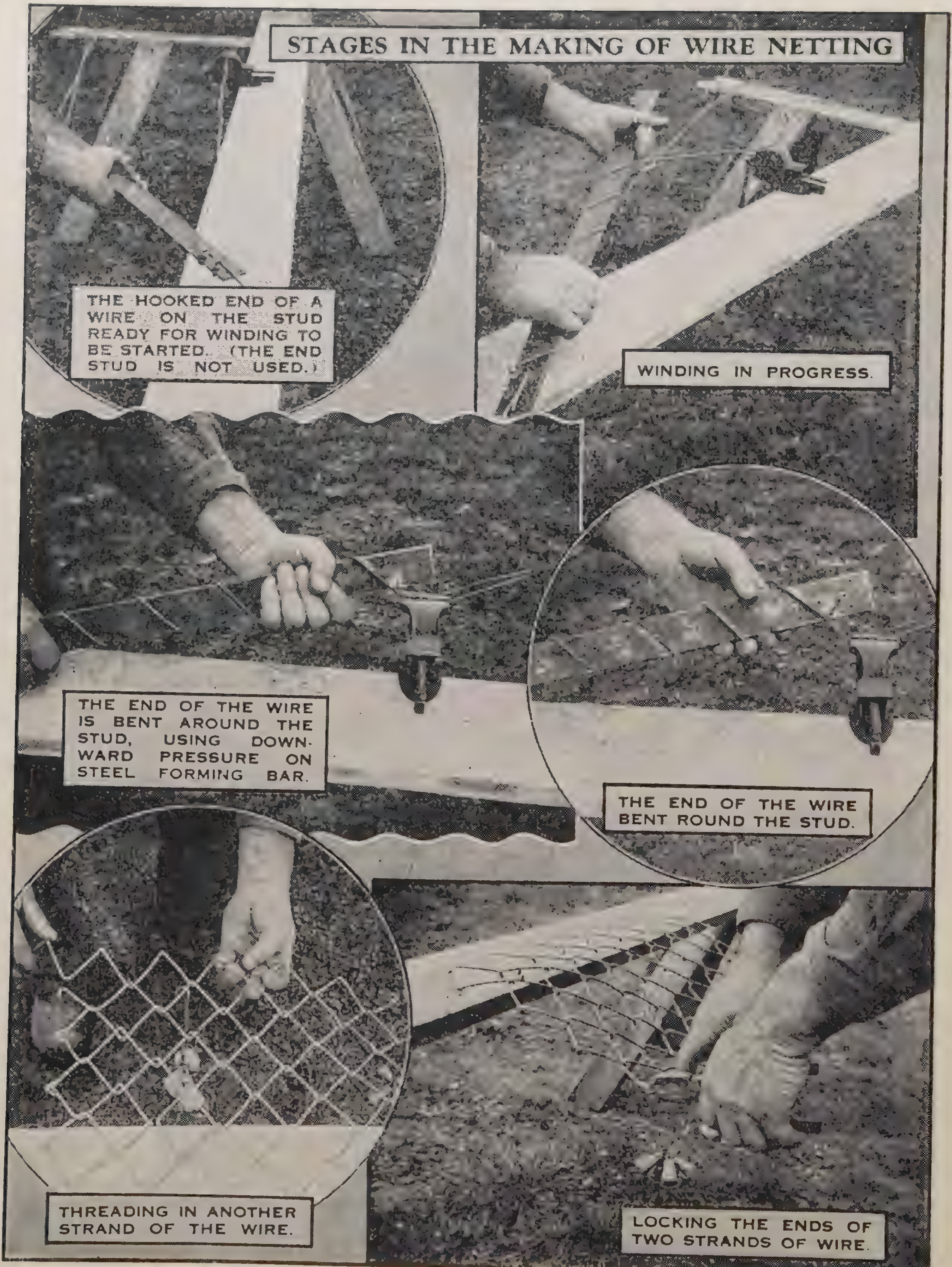
Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in October as follows:—

Whangarei—1XM, on October 25, at 12.35 p.m., "Seasonal Problems," by J. Wheeler, Supervisor, Northland District Pig Council.

Napier—2YZ, on October 14, at 7.15 p.m., "The Handling of Concentrated Feeds," by H. T. Donaldson, Supervisor, Tairawhiti District Pig Council.

STAGES IN THE MAKING OF WIRE NETTING



THE HOOKED END OF A WIRE ON THE STUD READY FOR WINDING TO BE STARTED. (THE END STUD IS NOT USED.)

WINDING IN PROGRESS.

THE END OF THE WIRE IS BENT AROUND THE STUD, USING DOWNWARD PRESSURE ON STEEL FORMING BAR.

THE END OF THE WIRE BENT ROUND THE STUD.

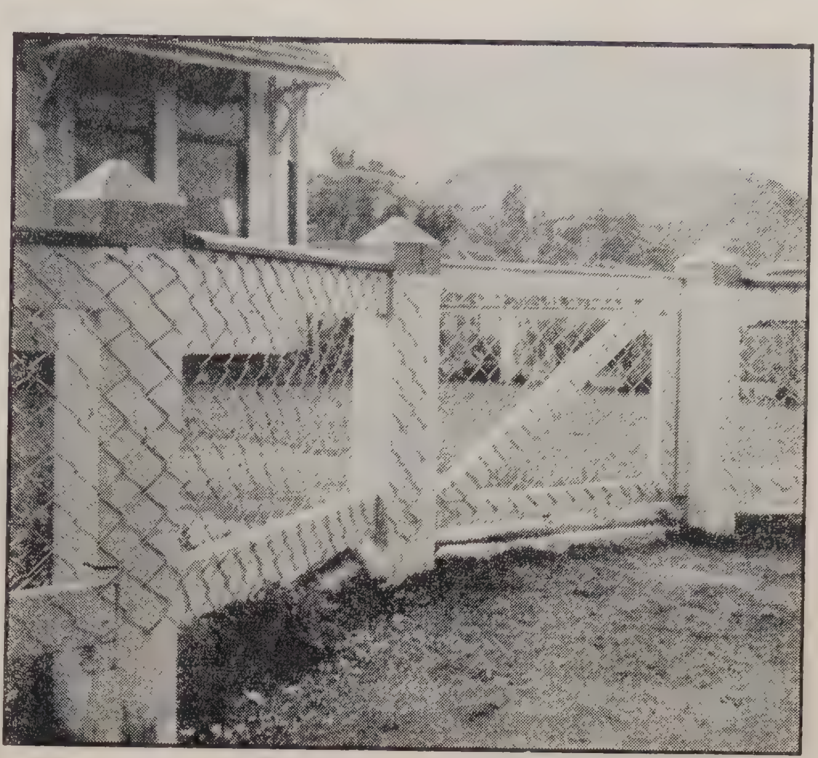
THREADING IN ANOTHER STRAND OF THE WIRE.

LOCKING THE ENDS OF TWO STRANDS OF WIRE.

Simple Method of Making Wire Netting

By G. J. GRAHAM, Seed Dressing Officer, Department of Agriculture, Gisborne.

WITH factory-produced wire netting now expensive and in short supply Mr. W. Gray, of Gisborne, has discovered a profitable way of using short lengths of wire by weaving them in his spare time into netting. Once the right technique had been evolved Mr. Gray found it surprisingly simple and he can now turn out a yard of first-class material in an hour.



A portion of Mr. Gray's strong and neat road fence, the wire netting for which was made according to the method described in this article.

THE only tools required are pliers with wirecutting jaws, bench vice, rule, hammer, and forming bar. (Weights, which can be hung on the netting by wire hooks, are also useful, but not essential.) The forming bar is the most important piece of equipment and care taken in its manufacture is amply repaid. Mr. Gray used a strip of mild steel 1½in. wide, 3/16in. thick, and 28in. long. Two 3/16in. holes were drilled 24in. apart as close to the same edge as possible. Threaded 3/16in. diameter bolts with round heads were inserted in these holes from opposite sides and held in position by nuts, one on each side of the bar to each bolt, leaving sufficient room for the wire to be hooked around the bolt below the head.

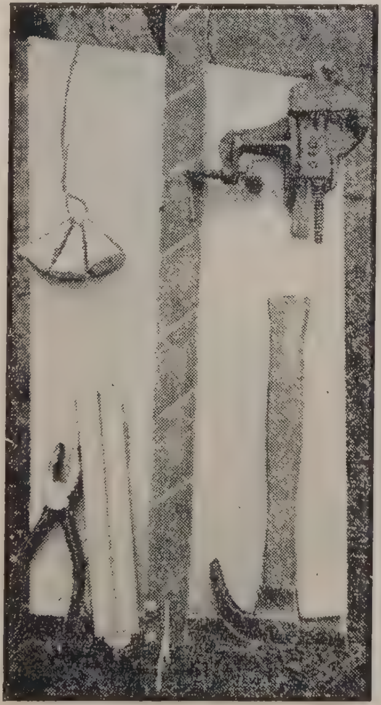
It is important that the studs formed by the bolts are on opposite sides, but on the same edge, of the bar.

The forming bar was marked by filing nicks at 3in. intervals along one edge between the studs; nicks at similar intervals, but at intermediate positions, were then filed on the other edge. This arrangement gives a diamond-meshed netting of 4 meshes to the running foot, 2ft. wide, but spacings on the forming bar and the dimensions of the bar could be modified to produce a mesh to suit individual needs.

Making the Wire Netting

Wires are cut in 3ft. 3½in. lengths and a hook formed with the pliers at the end of each wire, the short side of the hook being not more than ½in. long. The straight end of the wire is placed in the vice and the other end hooked over the stud at one end of the forming bar. (To keep a uniform pattern it is necessary to start on the same stud each time.)

Next, the bar is twisted, applying a steady tension, so that the wire crosses each edge where the file marks were made. If a good sharp twist is given each time the wire crosses an edge, the wire should lie snugly on the bar; if the wire does not fit correctly, it should be tapped with a hammer.



Tools required for making the wire netting.

When the far end of the wire is reached the wire should be bent slightly round the stud before being removed from the vice, to indicate the correct position for locking with the next wire when assembling. The wire should then be disengaged from the forming bar, care being taken not to strain bends unnecessarily.

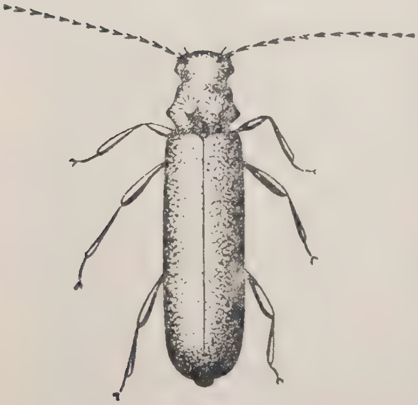
Fastening Off

When a sufficient number of wires has been dealt with one of them should be lightly stapled along the edge of the bench at 3 or 4 points and the next wire threaded through it, using a twisting motion. Wires are fastened off by interlocking and squeezing in the hooked ends. The third wire is threaded through the second and so on until the required length of netting is completed. If weights are hung on the second and subsequent wires, they will help to keep the material spread to allow easy threading of the wires.

Ten- to 14-gauge wire is ideal for making up into netting, anything heavier being too hard to work. Wire from packing cases, which most stores are glad to give away, is suitable.

Working in his spare time only, Mr. Gray has made about 50 yards of netting, which he has used to renovate his front fence and erect another short fence within his section.

6d each
paid for these
BORER
BEETLES



Note prominent hump on each side of head with large swelling on top . . .

TWO-TOOTHED LONGHORN

(AMBEODONTUS TRISTIS—do not confuse with lemon tree borer.)

DISTINGUISHING FEATURES:

The two-toothed longhorn beetle is ½" to 1" long and narrow bodied. Dark reddish colour with thin and irregular covering of fine short yellow hairs. Just below the head there is a broad conical spine sticking out each side. On top of each spine there is a shining round swelling. Minute warts cover the back. The head is pitted with numerous holes. Beetle exit holes from timber are oval and up to 1/3" across the widest diameter.

Probably the most destructive borer in New Zealand. Life cycle is at least 5 years, possibly 12-15 years. Thus the 1" long grubs have plenty of time in which to do damage. Burrows may extend many feet through joists, studs, flooring, wall boards, etc. without breaking surface. Beetles shun strong light and prefer to emerge on the underside of timber SO LOOK UNDERNEATH THE HOUSE. Beetles frequent old macrocarpa stumps and are prevalent in houses built on old bush areas. No real research has been done in N.Z. on longhorn eradication and the Boracure Laboratory will pay 6d. each for the first 5,000 live beetles sent in, with a special price of £10 for the largest individual collection.

Beetles must be kept separated as they seize each others legs and antennae and won't let go. Pack in individual containers (preferably tins) or separated by several thicknesses of paper. Wrap securely and send to The Laboratory, Boracure (N.Z.) Ltd., P.O. Box 632, Wellington. State number of beetles sent, print your name and full address.

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NORTH ISLAND FAT-LAMB CROSSES

By
D. E. WALKER, Research Officer,
Department of Agriculture Animal
Research Station, Ruakura.

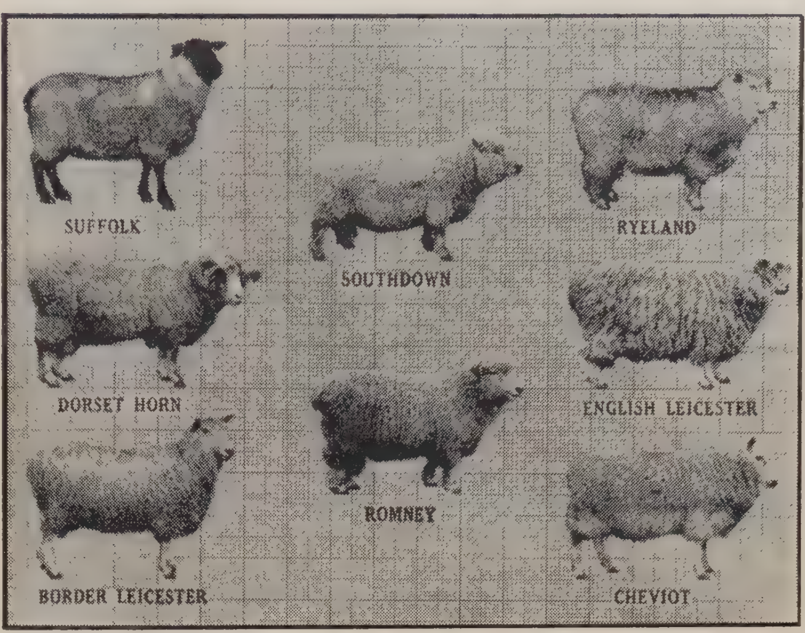


Fig. 1—A selection of the rams used in the breeding experiments.

THE Southdown-Romney lamb has been the only fat-lamb cross of any importance in the North Island during the last 20 years. The type of lamb produced by this cross has been found most suited to New Zealand's normal export market and, although other ram breeds have been tried, and are still being used to a very limited extent, farmers in the main have been content to conform with the policy of the New Zealand Meat Producers' Board and concentrate on the production of lightweight Down type lambs. Nevertheless, at the Department of Agriculture's Animal Research Station at Ruakura advice is still frequently asked for about other crosses. Because nothing better than opinions and prejudices, based on meagre observations and hearsay, could be offered by research workers or by farmers, and because it is the task of a research station to provide facts, it was decided 3 years ago to compare the various crosses under the same environmental conditions on fat-lamb country.

TO this end, for comparison with the normal Southdown and Romney as sires, six other breeds which were most common, suitable, and available were selected. These were the Ryeland, Dorset Horn, Suffolk, Border Leicester, English Leicester, and Cheviot. A selection of the rams used is shown in Fig. 1.

The Sire Breeds

The Southdown with its small, compact, short-legged, and deeply-fleshed body is obviously the ideal quality meat animal and is generally considered to be the most highly improved mutton breed of the world.

In itself the Romney has no real importance or prospects as a fat-lamb sire of quality, but a proportion of the wether lambs off the hill country must be slaughtered each year and they contribute a substantial percentage of the total export kill. The Romney was, therefore, included in this comparison.

For many years the Suffolk, which originated from a cross between the Southdown and the old Horned Norfolk breed, has been one of the most popular fat-lamb sires in England. Both straight Suffolks and Suffolk crosses have been very successful in carcass competitions at Smithfield, and the breed is employed to produce carcasses of 50-65lb. dressed weight. Although it is a large, long-legged breed, the Suffolk is deeply fleshed and well proportioned.

The Dorset Horn is to some extent handicapped by its horns, which are a menace to fences in New Zealand and make handling in the shed and yards more difficult. However, it is becoming increasingly popular in Australia, partly on account of its extended breeding season, which fits it to the marked seasonal variations of that country. Australian breeders are seeking to evolve a polled type. Although a tendency toward long legs and rather ungainly bodies exists in the breed, short-legged, deeply-fleshed, compact strains are available.

Border Leicesters were formerly used quite extensively in the North Island, but have practically disappeared with the increasing use of the Southdown. They are a long-legged, big-framed, hardy breed, reputedly tracing their origin, through the activity of the border raiders, to the Cheviot from the north and the English Leicester from the south.

The Ryeland is a Down breed still used to a certain extent in the North Island. A larger animal than the Southdown, it still has the thickly-fleshed characteristics typical of Down breeds. Perhaps partly for the reason that carcasses of this cross have the reputation of not grading quite as well as those of the Southdown, it has never attained the popularity of the latter.

Although the English Leicester was one of the earliest improved British breeds, it does not fulfil modern requirements of either the producer or the consumer. The cross is considered by many farmers to be one of the latest maturing and more useful where lambs are fattened on crops, as in the South Island.

In view of the fresh interest that has been aroused in the possibilities of the Cheviot for second-class hill country, this breed was included for the same reason as the Romney, although it was realised that there was little prospect of its becoming of any great importance except as a by-product of hill farms.

All these breeds have been tried out by individual farmers in the past and have been gradually abandoned over the years in favour of the Southdown, except in the case of a small minority who have always retained their partiality for one breed or another in the face of public opinion and trade

TABLE I.

Cross	Total % fattened off mother	% killed 1st draft	Carcass wt. (lb.)	Grading Percentages Down	Grading Percentages Prime	Grading Percentages Second	Average return per lamb*
Southdown ..	91	39	34.6	90	8	2	34/-
Ryeland	94	47	34.9	39	56	5	34/4
Suffolk	89	47	39.9	13	81	6	37/4
Dorset Horn ..	91	54	38.1	14	81	5	36/-
Border Leicester ..	83	48	38.9	9	90	1	35/11
Eng. Leicester ..	76	29	37.1	10	87	3	35/5
Cheviot	80	36	35.7	6	77	17	33/11
Romney	72	18	34.9	5	73	22	33/6

* Calculated on opening schedule based on 11⅞d. per lb. for Down 2's on December 9 (the ruling price for the middle season) to overcome seasonal price fluctuations.

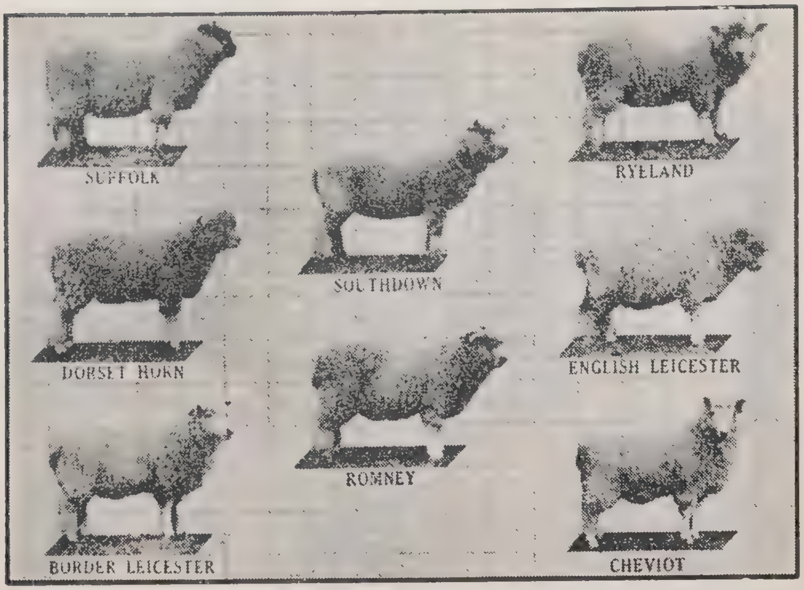


Fig 2—Representative lambs on the hoof of approximately equal weight at the time of first drafting. They have been scaled to the same wither height.

demands. No definite and comparative facts in terms of figures existed, however, and in any case farms, farmers, and seasons vary and for a strict comparison the influence of these factors must be commonly shared. It was therefore necessary to compare the breeds on the same basis.

Procedure

For the past 3 years two selected rams of each of these breeds were mated to 50 to 60 Romney mixed-age ewes each season. The ewes were run together from the end of tupping till the lambs were drafted under typical Waikato fat-lamb management conditions at 4 to 5 ewes per acre. In the first two seasons the same pairs of rams were used, but they were all replaced in the third season.

Results

Data for all three seasons have been bulked to provide an average picture and Table 1 on the previous page gives a summary of the more important results from a farming angle.

A first draft was taken in mid-December and a second, varying with season, some time in January.

Rate of Maturity

The Southdown, Ryeland, Suffolk, and Dorset Horn crosses all fattened well, but the Romneys, English Leicesters, and Cheviots were noticeably inferior, as might be expected. Although the total drafting percentage of the Border Leicester cross was lower, a high percentage of the total number fattened were ready at the first draft. It therefore offers possibilities where lambs are weaned on to crops. The Dorset Horn cross showed up as the earliest maturing, over 50 per cent. being killed in the first draft each season. The later-maturing qualities of the Romney and English Leicester, on the other hand, are shown up by the low percentages sent away in the early draft. On most fat-lamb country in the North Island early maturity is a decided advantage. Though the Southdown has always received great credit as the sire of early-maturing lambs, these results suggest that other improved mutton breeds may have comparable virtues in this respect. However, under different conditions this situation may be altered.

Carcass Weight

As regards carcass weight the market demand has been for lightweight (32-36lb.) lambs. The Southdown and Ryeland crosses fell into this category. The heavier breeds, the Suffolk, Dorset Horn, and Border Leicester, sired heavier-weight lambs, a fact to which some importance might be attached in these days of meat shortage.

Grading Quality

The superiority of the Southdown cross lamb from a qualitative point of view is well illustrated by the high percentage graded Down. This percentage was not approached by any other breed, the Ryeland being the next in order with less than half the percentage, while the percentages

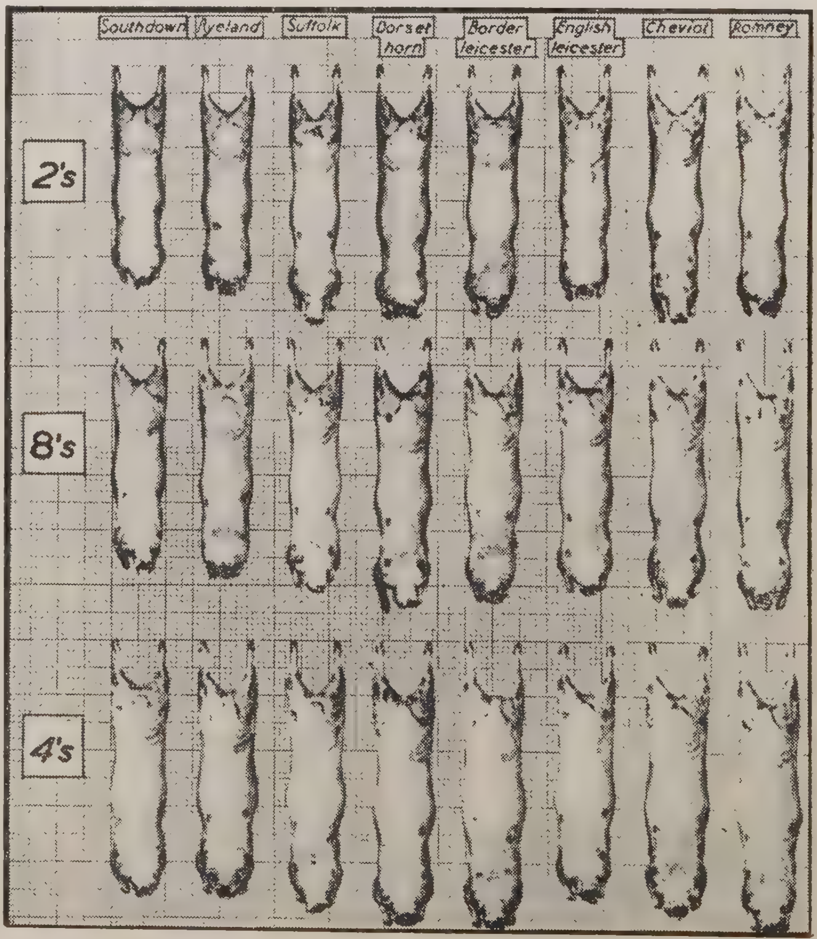


Fig. 3—Average carcass of each grade for each cross.

gained by the other crosses are almost negligible. Grading, however, has less influence on monetary returns than weight, as the average returns show.

Fig. 2 shows representative lambs on the hoof of approximately equal weight at the time of first drafting. These have been scaled to the same wither height.

An average carcass of each grade for each cross is shown in Fig. 3.

The Southdown cross lambs are noticeably the best in each grade. They are short in the legs and wide in the gigots, giving a good cut of meat in the leg joint, are well filled in the loin, and show good development in the fore end with a minimum of low-priced neck. Fat cover is well distributed over the whole body. The only other breed grading an appreciable number of Downs was the Ryeland cross, and this shows the next best type of carcass. It is slightly longer in the leg and not so well filled in the crutch. In the loin region there is little to choose between the two types, but the Southdown has a slight advantage in the fore end. The larger breeds, the Suffolk, Dorset Horn, and Border Leicester, all yielded carcasses 10 to 15 per cent. heavier than the Southdown cross and approximately the same percentage longer in the legs, so that as they are only slightly wider in the gigots, the conformation as a whole is not as good as that of the Southdown or Ryeland. The fore ends are not so well developed and necks are longer. Fat cover is not as even and, in the Dorset Horn in particular, the points are inclined to be bare. The English Leicester also throws a heavier lamb than the Southdown. Carcasses of this cross are longer in body and legs and therefore deeper in the crutch, without being substantially wider in the gigots than the Southdown cross. On the whole, therefore, the type of carcass is not very desirable, although the fore end is rather better developed than those of the Suffolks, Dorset Horns, and Border Leicesters. However, some of the best lambs attain heavy weights and give good carcasses over 42lb. Under fat-lamb farming conditions the Cheviot cross measures up rather better than the English Leicester or straight Romney, but the type of carcass produced does not compete with those of the other crosses. It is long in the leg for the comparatively small advantage in weight it has over the Southdown cross and is poorly developed over the shoulders and long in the neck. The straight Romney shows a slightly better fore end, but the more valuable hind end is of poor conformation.

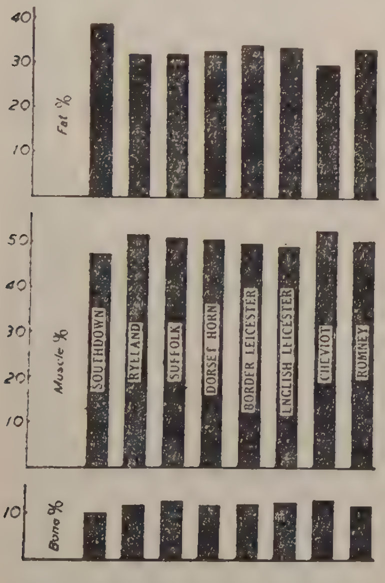


Fig. 4—Percentage carcass composition of each cross.

Carcass Composition

During the past season five carcasses of each cross have been dissected to obtain an indication of the relative composition of each cross in terms of bone, muscle, and fat. The carcasses were selected from the first draft and approximated as closely as possible to the average of the group in weight, grade, and carcass measurements. The dissection results are shown graphically in Fig. 4.

Though on the whole differences were not very great, the Southdown cross lamb carried considerably more fat than the other crosses. In view of the demand for lean meat under rationing and pre-war complaints from the trade that New Zealand lamb carried excess fat, it appears that the capacity of other crosses to produce lean meat may be important. Recent indications point to the need for exporting lean rather than fat meat to a market suffering from rationing. The breeds producing the heaviest weight —Suffolk, Dorset Horn, and Border Leicester—achieve this result not merely without excessive fat, but with more lean meat than the popular Southdown.

Summary

Although it is recognised that the breeds concerned may vary in their response to different conditions, the object has been a comparative study of the different crosses when subjected to the same environmental conditions. No evidence has been obtained to suggest that the Southdown cross lamb does not merit its reputation for producing the most desirable type of carcass from the viewpoint of established standards of quality. Both grading results and carcass measurements confirm this. Little difference was found in the fattening ability of the Southdown, Ryeland, Suffolk, and Dorset Horn crosses, approximately the same percentage of each being fattened off their mothers. The larger sire breeds, the Suffolk, Dorset Horn, and Border Leicester, yielded lambs 4 to 5lb. heavier in carcass weight than those of the Southdown, and weight exerted a greater influence on monetary returns to the farmers than did grading, so that the returns per head were higher for the heavier crosses than for the better-grading Southdown cross.

As regards the carcass composition of the various types, the Suffolk, Dorset Horn, and Border Leicester crosses had more bone and muscle and less fat than the Southdown cross.

The data provided should at least give the fat-lamb producer a sounder basis for deciding his production policy than has been available so far.

SHOW DATES

THE following are dates and venues of A. and P. shows up to mid-December.

October 15—Ellesmere A. and P. at Leeston.
October 19 and 20—Hawke's Bay A. and P. (spring show) at Hastings.
October 22—Timaru A. and P. at Timaru.
October 22—Northern A. and P. at Rangiora.
October 27, 28, and 29—Waikato A. and P. at Hamilton.
October 28 and 29—Poverty Bay A. and P. (spring show) at Gisborne.
October 28 and 29—Wairarapa and East Coast A. and P. at Carterton.
November 3—Ashburton A. and P. at Ashburton.
November 3, 4, and 5—Manawatu and West Coast A. and P. (Royal show) at Palmerston North.
November 5—Amberley A. and P. at Amberley.
November 10 and 11—Canterbury A. and P. at Christchurch.
November 11 and 12—Wanganui A. and P. at Wanganui.
November 12—Waihi A. and P. at Waihi.
November 16—North Otago A. and P. at Oamaru.
November 16 and 17—Marlborough A. and P. (South Island Championship show) at Blenheim.
November 18 and 19—Egmont A. and P. at Hawera.
November 19—Waimate A. and P. at Waimate.
November 22 and 23—Thames Valley A. P. and H. at Te Aroha.
November 25 and 26—Nelson A. and P. at Nelson.
November 25 and 26—Stratford A. and P. at Stratford.
November 26—Banks Peninsula A. and P. at Little River.
November 26—Kaikohe A. P. and H. (horse show) at Kaikohe.
November 26—South Otago A. and P. at Balclutha.
November 29 and 30—Otago A. and P. at Dunedin.
December 3—Winton A. and P. at Winton.
December 3—Tokomairiro A. and P. at Milton.
December 6 and 7—Gore A. and P. at Gore.
December 10—Motueka A. and P. at Motueka.
December 10—Wyndham A. and P. at Wyndham.
December 13 and 14—Southland A. and P. at Invercargill.
December 17—Otago Peninsula A. and P. at Portobello.

Fat-lamb Crosses in Canterbury

By I. E. COOP and V. R. CLARK, Canterbury Agricultural College, Lincoln. (From a paper presented to the New Zealand Animal Production Society in May, 1949.)

THE province of Canterbury, extending from the Conway River in the north to the Waitaki River in the south and stretching back to the Main Divide, occupies 9½ million acres and carries 5½ million sheep, of which 3½ to 4 million are breeding ewes. On the tussock-land hill country store sheep are produced, and on the plains fat-lamb production is associated with arable farming. Because of the relatively dry climate and cold winter, supplementary feeding of ewes in winter and of weaned lambs in summer is necessary on most fat-lamb farms. Over Canterbury as a whole fine-woolled sheep predominate, and there are approximately 3 fine-woolled halfbred and Corriedale ewes to every 2 Romneys, both on the hill and on the plains. These factors should be borne in mind when considering the fat-lamb industry of the province.

FROM an analysis of the proportion of fat-lamb to breeding-ewe sires it is estimated that 1¾ million ewes are mated each year to fat-lamb sires and 2 million to halfbred, Corriedale, and Romney rams. Of fat-lamb sires used 60 per cent. are Southdown, 20 per cent. are Border Leicester, and 20 per cent. are Ryeland, Suffolk, English Leicester, and other breeds. The considered opinions of experienced Canterbury farmers and fat-lamb buyers place the proportion of lambs drafted fat off the mothers on fat-lamb farms at well below 50 per cent. An analysis of lamb killings at all Canterbury freezing works puts the percentage between 30 and 35. From this it is clear that even for Southdown cross lambs the figure is well below 50 per cent.

This very brief introduction to the position in Canterbury serves merely to give a background to the experiments now to be described. It was decided to compare and investigate on a strictly comparable basis the relative merits of the Southdown and Border Leicester as fat-lamb sires. The Southdown is usually considered to be best suited for production of milk lambs of light weight and high quality and the Border Leicester for feeder lambs of heavier weight though of poorer carcass quality.

Design of Experiments

The experiments were carried out over two complete seasons (1947-48 and 1948-49) at the Kirwee Experimental Farm, which was then on loan to the Canterbury Agricultural College, Lincoln, from the Department of Agriculture. Uniform lines of 5- and 6-year-old Romney and Corriedale ewes were randomised into the following groups, each of 60 ewes.

Group	Ram		Ewe
I	Romney	x	Romney
II	Southdown	X	Romney
III	Border Leicester	X	Romney
IV	Corriedale	X	Corriedale
V	Southdown	X	Corriedale
VI	Border Leicester	X	Corriedale

Just before lambing each group was subdivided into two, one of which was placed on a high plane of nutrition and the other on a low plane. The high-plane feeding, consisting of first-class pasture, was designed to produce a large percentage of lambs drafted fat off the mothers. The low-plane feeding, consisting of poor pasture heavily stocked, was intended primarily to provide store lambs for subsequent fattening on rape and secondarily for comparison of breed crosses under poor feeding conditions.

To make the sheep used as representative of the breed as possible an entirely new set of ewes bred on different country was used in the second year and a new set of rams was also used. All the rams were bred at the college.

All ewes and lambs were weighed at approximately monthly intervals. The final weighing and drafting were done on one day. The lamb buyer who drafted the lambs was instructed not to take many "seconds" and not to be more discriminatory with any one cross than with another. Individual carcass weights, grades, and measurements were made at the freezing works. The lambs could have been drafted on a purely objective live-weight basis of Southdown cross 65lb. and over, pure Romney and Corriedale 70lb. and over, and Border Leicester cross 75lb. and over. It is believed that this is more accurate, and a column representing the percentage of lambs that would have been drafted on such a basis has been included in the tables.

Results Obtained

The results obtained for the high-plane single lambs during the seasons 1947-48 and 1948-49 are given in Tables 1 and 2 respectively. Twins have not been considered, as the numbers in both seasons were very small. The number of singles per group averaged 20 with extreme variations of 15 to 25.

Low-plane Lambs Drafted

Very few lambs were drafted fat from the low-plane groups. On an average the lambs were 10 to 15lb. lighter than those on the high plane. As an average over both seasons the Southdown increased live weight by 4lb. in comparison with the pure breeds, and increased the percentage of single lambs drafted fat from about zero to 35 per cent. The use of the Border Leicester increased live weight by a further 5lb. over the Southdown, but with a drop to 20 per cent. drafted fat. Here the superior conformation of the Southdown enabled more to be drafted.

Rape Lambs

The weaned lambs were fattened on rape for 7 to 8 weeks in both seasons. There were 20 to 40 lambs per group.

HEADING PHOTOGRAPH: Some of the sheep used in the trials.

In Table 3 are recorded the live-weight gains and the carcass weights of these lambs.

From the results quoted the following conclusions may be drawn:—

1. By comparison with the pure breeds the Border Leicester increases live weight, percentage drafted, and carcass weight, whereas the Southdown increases percentage drafted only.

2. Comparison of the Border Leicester with the Southdown on good feed, shows that lambs by the former are invariably 10lb. heavier in live weight and 4lb. heavier in carcass weight at the same age at weaning. The percentage of lambs drafted has varied somewhat between seasons and between dams, but on average there has been no difference between the Border Leicester and Southdown crosses.

3. The percentage of second-grade crosses was low, and what variations there were between breeds do not alter the conclusions mentioned.

4. From live-weight data there is no evidence that the comparisons would have been altered significantly by drafting earlier.

TABLE I—HIGH-PLANE LAMBS, 1947-48. SINGLES ONLY.

Ram		Ewe	Average live wt.	% Drafted	% Drafted on wt. basis	Av. carcass wt.	% Second grade
			lb.			lb.	
R	X	R	66.8	40	40	33.4	14
SD	X	R	67.8	70	65	35.4	7
BL	X	R	78.4	62	80	38.8	0
C	X	C	62.9	33	35	35.3	0
SD	X	C	62.3	33	42	33.6	0
BL	X	C	76.6	78	67	38.2	21

Note I. The percentage drafted (third column) is that drafted by the lamb buyer. The average carcass weight (fifth column) and percentage of seconds (sixth column) refer to this draft of lambs. The fourth column gives the percentage which would have been drafted on the objective weight basis mentioned.

Note 2. No corrections have been made for male to female ratio.

Note 3. The average age of all Southdown and Border Leicester cross groups was 111 days at drafting, and that of Romneys was 109 and Corriedales 113 days.

TABLE 2—HIGH-PLANE LAMBS, 1948-49. SINGLES ONLY.

Ram		Ewe	Average live wt.	% drafted	% Drafted on wt. basis	Av. carcass wt.	% Second grade
			lb.			lb.	
R	X	R	78.1	83	78	37.5	7
SD	X	R	77.9	100	100	37.1	0
BL	X	R	88.5	100	100	41.4	5
C	X	C	67.6	60	43	34.0	33
SD	X	C	72.9	90	85	35.7	5
BL	X	C	82.5	74	70	39.9	0

Note I. See note I above.

Note 2. See note 2 above.

Note 3. Because of the Christmas-New Year break the lambs were on an average 121 days old at drafting, with extreme group averages of 120 and 122 days. It could be said that the lambs should have been drafted earlier. They were weighed at 90 days and on the 65/70/75lb. live-weight basis already mentioned the percentages drafted would have been as follows:— R x R 67 per cent., SD x R 69 per cent., BL x R 70 percent., C x C 5 per cent., SD x C 59 per cent., BL x C 35 per cent.

TABLE 3.—LIVE-WEIGHT INCREASES OF STORE LAMBS ON RAPE (lb.)

			1947-48			1948-49		
Ram — Ewe			Av. initial live wt.	Av. live-wt. gain	Av. carcass weight	Av. initial live wt.	Av. live-wt. gain	Av. carcass weight
R	X	R	57.3	24.6	36.3	56.3	25.0	35.8
SD	X	R	58.8	21.9	37.9	53.0	24.0	35.9
BL	X	R	65.2	27.3	41.5	62.4	25.9	40.5
C	X	C	56.8	23.0	36.1	55.9	21.8	35.2
SD	X	C	55.6	21.7	35.7	53.9	21.4	35.3
BL	X	C	60.4	25.4	38.6	60.4	25.5	38.9

5. On the low-plane feeding the Border Leicester cross lambs had a 5lb. live-weight advantage over the Southdown, but this was offset by a lower percentage drafted (20 per cent. as compared with 35 per cent.). This is a strong point in favour of the Southdown under conditions of poor feeding.

6. The live-weight gains of feeder lambs on rape in a given time were consistently in the order Border Leicester, pure breed, Southdown, though the differences were significant in only one of the two seasons. The carcass weights of the Border Leicester feeder lambs were 3½ to 4lb. heavier than those of the Southdown, with no differences in the percentage of seconds. This offsets the advantage of the Southdown mentioned in paragraph 5.

7. Comparison of the effect of the breed of ewe shows that lambs out of the Romneys proved to be superior to those out of Corriedales in live weight, percentage drafted, and carcass weight.

Interpretation of Results

The results of the trials described may be summed up by saying that in comparison with the Southdown sire the Border Leicester sire gives a 10 per cent. increase in meat production, with little if any reduction in percentage drafted off the mothers and without loss in grading. This applies both to milk lambs and feeder lambs and to lambs out of both Romney and Corriedale ewes.

The trials extended over two seasons only and on one set of environmental conditions only. For this reason they are being continued at Ashley Dene (Lincoln College). Nevertheless, in spite of these limitations, it is believed that the trials have indicated something which has hitherto not been realised fully.

New Zealanders have always been led to believe that the Southdown is the fat lamb sire without serious rival from any quarter. Indeed the good name of New Zealand lamb and the present status of the fat-lamb industry in the country as a whole is to a large extent dependent on the use of the Southdown sire. The greatest care

Corriedale ewes on the Kirwee type of country in mid-winter.

FAT-LAMB CROSSES IN CANTERBURY . . .

must therefore be exercised in interpreting the results of the trials described. Accordingly several aspects of the Border Leicester-Southdown comparison must be mentioned. The Southdown gained its popularity as a sire for the 28-36lb. lamb, which was in demand before the war and for which a differential price schedule and grading system were evolved. For such lambs there is still no rival to the Southdown, but if it is desired to produce more meat, it seems a little incongruous to encourage the production of lightweight carcasses. If the trials carried out over two seasons at Kirwee can be considered a fair and accurate comparison, it appears that meat production could be increased by at least 10 per cent. by no other means than using a different sire, a heavyweight sire in place of the lightweight Southdown.

It might be argued that the 10 per cent. more weight may not contain 10 per cent. more calories. Certainly at equal carcass weights the Border Leicester cross lambs contain less fat and hence fewer calories than the Southdown cross, but with a Border Leicester cross carcass 4lb. heavier than the Southdown cross the difference in calorie content is probably small. A few Border Leicester cross lambs have been dissected and shown to contain approximately 1 per cent. more bone, ½ per cent. more fat, and 1½ per cent. less muscle than Southdown cross lambs 4 to 5lb. lighter in carcass weight.

On the question of grading it should be remembered that in Canterbury there are only two grades, Prime and Second. In the North Island, where there is a third and top grade, Down cross, there is no doubt that the Border Leicester would be handicapped. The Border Leicester cross carcasses are longer in the leg and few would grade Down cross, whereas many of the Southdown cross carcasses would. This difference in quality grading, together with a higher weight grade, means that in the North Island the Border Leicester cross carcass is worth ¾d. per lb. less than the Southdown cross lamb. Instead of getting 4s. for the extra 4lb. the North Island farmer receives 1s. 8d. and the South Island farmer 2s. 4d. There is little doubt that if advantage is to be taken of this means of increasing meat production, the lamb-grading system must be revised so that the farmer is encouraged to produce heavier-weight lambs and is rewarded in proportion to the extra meat produced.

Throughout the Kirwee trials the Border Leicester sire has been used as representing the heavy fat-lamb sires. Others may well produce a similar result. Suffolk, Shropshire, Dorset Horn, Ryeland, South-Suffolk and Southdown X Border Leicester, and other similar rams might be expected to produce heavier lambs than Southdown cross lambs. Whether they would give the same percentatge fat off the mothers has yet to be investigated. It is possible that more favourable results even than those achieved with the Border Leicester might be obtained from the heavy Down breeds, as they are less leggy and their lambs might grade better under the North Island grading system. Any change from the Southdown to the heavy sires must be slow, as the ram-breeding flocks of the latter breeds are few and small. Though a change in this direction should certainly be made if more meat is wanted, another but less tangible possibility remains to be explored. Some breeders maintain that the present-day Southdown is much smaller than it used to be 20 or 30 years ago. Such a belief would be difficult to confirm, but it suggests that Southdown breeders, having achieved conformation, might now concentrate on getting size into the breed. In other words, it may be possible to evolve within the Southdown breed itself a larger and heavier strain than that now in use. Such a procedure, if it is possible, would probably take longer, but would have the advantage that there are already many Southdown flocks in the country and it would cause less disturbance to the present organisation of the fat-lamb industry.

Basically, however, the problem lies in predicting the long-term fat-lamb market. For the next 5 or 6 years there is a guaranteed market, but what lies beyond? Will there again be a quota and a highly-selective market? If so, no move that would hinder a rapid return to the lightweight Southdown cross lamb should be made, but if world food shortages, and meat shortages in particular, are to continue for another 10 years or longer, as food production struggles to keep pace with world population trends and increasing standards of living, a different situation exists. For such a situation it seems that this country's meat-producing potentialities are not being exploited to the full by using a lightweight sire.

Probably in no place is there a brighter future for the heavy sires than in Canterbury. The low percentage of lambs drafted fat, the absence of a Down cross grade, the highly-seasonal nature of pasture production, the association of fat-lamb production with arable farming, and the presence of heavy sire studs within the province all favour continued and even greater use of the heavy sires; but if the alleviation of long-term world food shortages is taken seriously by the meat producers of New Zealand, increased meat production should be possible in all provinces.

Spraying Weeds in Growing Crops

On page 36 of the July issue of the "Journal" the statement was made that linen flax could be safely sprayed with light applications of hormone weedkillers. Recent work at the Agronomy Division, Department of Scientific and Industrial Research, has shown, however, that this may result in considerable damage to the fibre, and farmers are therefore advised not to use hormone weedkillers on linen flax crops in the meantime.

DEATH OF MR. W. CRAWFORD

THE death occurred suddenly on July 28 of Mr. William Crawford, Superintendent of Cheese Instruction, Department of Agriculture, Wellington.

Mr. W. Crawford.

Mr. Crawford came from a farming family and was born at Maheno, near Oamaru, on September 9, 1889. His career in the dairy industry began in the Woodlands cheese factory in Southland in 1905. In 1906 he went to Taranaki, where, in addition to furthering his knowledge of cheesemaking, he gained experience in buttermaking in the dual-plant factory of the Mells Dairy Company at Mokoia. During the 1907-08 and 1908-09 seasons he was buttermaker in the Meremere dairy factory, and afterward, though still gaining further experience in buttermaking, he specialised in cheese, working successively for the Hawera, Cape Egmont, and Riverdale Companies and the T. L. Joll Company's Okaiawa branch until 1917. He managed the Okaiawa branch for two seasons, being succeeded by his brother, Mr. O. Crawford, now living in New Plymouth. In 1917 he returned to the big Riverdale factory as manager.

It was from Riverdale that he joined the staff of the Dairy Division of the Department of Agriculture as a Dairy Produce Grader at Patea in 1925. In 1928 he was appointed Dairy Instructor (Cheese), with headquarters at New Plymouth, where he remained until promoted to the position of Superintendent of Cheese Instruction in 1945, working from the Division's head office in Wellington.

Mr. Crawford had a wide knowledge of all matters relating to the manufacture of dairy products, particularly cheese, and to dairy factory management and practice. His outstanding personal characteristics were tact and modest courtesy. These qualities were of special value to the industry through the difficult years of zoning and change-over of supply during the earlier part of the war.

Extraction and Treatment of Manuka Honey

THOUGH manuka *(Leptospermum scoparium)* is distributed throughout New Zealand, only in a few areas is the honey produced from this great nectar-bearing shrub extracted for commercial purposes. In some districts outside these areas it is almost impossible in certain seasons to avoid removing some manuka honey from the hives when harvesting the main crop. The preparation of manuka honey for marketing is the subject of this article by R. S. Walsh, Apiary Instructor, Department of Agriculture, Auckland.

[After R. M. Laing and E. W. Blackwell in "Plants of New Zealand;" published by Whitcombe and Tombs Ltd.

DURING extracting operations combs containing manuka honey and honey from other sources prove troublesome in the extractor because the balance of the machine is upset, as the lighter honeys leave the combs rapidly while much of the manuka honey remains unextracted. In addition, the pronounced flavour of manuka honey can influence considerable quantities of milder-flavoured honeys with which it may become mixed. In these circumstances manuka honey is usually regarded as a distinct nuisance and a possible cause of lowering the sales value of the honey crop.

However, if a broader view is taken and the value of manuka honey in relation to colony welfare and development is considered, it must be regarded as of great benefit to the beekeeper. When the flow from manuka precedes the main clover flow by some weeks it provides food during a dearth period and at a very critical time in the life of the colony, maintaining hive strength and creating a reserve of stores against any unexpected delay in the start of the main flow. A slight surplus above early seasonal requirements can be of considerable value if retained on the hives as stores for the winter. In addition, success in raising early queens and making spring increase is assured where the flow of manuka nectar is good.

In parts of the Waikato, Auckland, and North Auckland manuka honey has come to be regarded as having a definite sales value of recent years and, particularly in the North Auckland area, beekeepers prepare their bees especially for the gathering of this crop.

Unusual Extraction Method

North Auckland beekeepers are particularly proficient in the handling of manuka honey from the moment of harvesting until it is packed for sale to the consumer. Not all manuka honey is the same, as some will leave the combs much more freely than that from another district or even from another apiary in the same area. Fairly-conclusive evidence is available that soil variations influence the flavour and colour of the honey, as does the intensity of the honey flow.

Manuka yields well in adverse weather, but is susceptible to cold winds, which can prevent nectar secretion. The viscid nature of manuka honey has resulted in the adoption of a pre-extraction procedure peculiar to North Auckland. Before the combs are put into the extractor, the jelly-like consistency of the honey is broken up by the use of what is known as a "pricker pad." Though the life of extracting combs is shortened considerably by this treatment, that is unavoidable, and about three-quarters of the honey, or 35lb. per super, is usually extracted. By the use of warming rooms and steam-heated prickers this average can be increased materially.

Extracting in this manner is tedious and calls for a great deal of extra work, but the amount of honey that can be extracted daily by experts in this method is surprising.

Making and Using the Pricker

The pricker pad can be made with little difficulty, but the work takes time. It should be large enough to treat a third of one side of a comb at each manipulation, but must be made slightly larger than necessary to cover this area. The materials required are a piece of five-ply wood 7½in. x 10in., sufficient 1¼in. fine nails to pierce each cell, a 1½in. piece of timber the same size as the five-ply, four ⅛in. bolts, and two handles. A sheet of comb foundation is laid over the five-ply to mark the positions to be drilled for the nail holes. When this is completed and the nails are embedded the 1½in. board is screwed to the five-ply and the handles bolted into position at either end of the board.

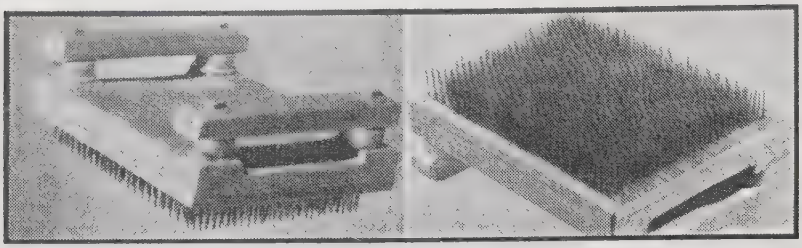
A little practice is needed before the pricker can be used to best advantage. The nails must not be forced through the mid-rib of the comb, but must be inserted to a depth which just allows the comb's resistance to be felt. A see-sawing motion is used when pressing the nails into the honey, as the object of pricking is to break up its jelly-like consistency. Both sides of the comb are pricked after it has been uncapped. A satisfactory type of stand on which to rest combs for the purpose consists of a metal tray with a raised centre. The honey that drains from the comb is held in the lower portions of the tray. When not in use the pricker stands in a steam-jacketed container where the nails are kept warm by immersion in heated honey.

Removal of Crop

Unless artificial heat is available in the honey house for keeping up comb temperatures, the weather should be studied before the crop is removed. Maximum hive temperature is reached about midday, and in warm weather the honey can be taken from the hives, pricked, and extracted with the loss of no more than 4 degrees of heat. If this can be accomplished, the honey leaves the combs freely, but it is not possible when working out-yards.

The positions of the combs in the hives in relation to the sun can result in uneven temperatures. It has been found that the portion of the comb facing south frequently is 4 degrees cooler than the section of comb lying toward the north.

TREATMENT OF MANUKA HONEY



[*Sparrow Industrial Pictures Ltd. photos.*

Top and bottom views of the pricker.

Heating and Drying Unit

Since the end of the war the use of controlled heat has come greatly into favour with larger beekeepers in North Auckland and Auckland districts. Most plants are designed on the combined heating and drying unit principle, devised by W. J. Fix and T. Palmer-Jones and described in a pamphlet, "Control of Fermentation in Honey by Indirect Heating and Drying," obtainable from Apiary Instructors of the Horticulture Division, Department of Agriculture. With this plant, honey brought in from out-yards can be raised to hive temperature and excess moisture practically eliminated.

Heavy manuka flows are experienced at times in North Auckland, and even weak colonies will gather a crop large enough to tax their bee strength beyond their capability of maintaining normal hive temperatures, thus making extraction difficult unless artificial heat is available in the honey house. However, manuka honey cannot be subjected to the same amount of heat as lighter honeys without loss of flavour and colour, nor is it advisable to apply direct heat, as the jelly-like constituent in manuka honey moves slowly while the liquid portion separates rapidly.

For this reason the press is the only satisfactory way of dealing with manuka cappings. The cappings should enter the press at about 88 degrees F. Usually five or six supers of honey are uncapped and the accumulated cappings put through the press, thus taking advantage of the heat retained by the cappings and disposing of them as the work proceeds.

Straining

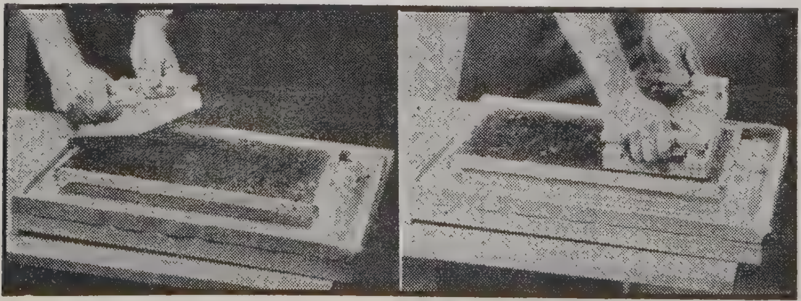
A coarse strainer is usually used beneath the gate of the extractor to hold any pieces of wax that may be dislodged from the combs during the pricking process. It also assists in breaking up the jellied portion of the honey. The main strainer is V shaped and is constructed of 40-mesh-to-the-inch gauze. Each side measures 2ft. 6in. x 2ft., as ample straining surface is essential.

Occasional scraping is necessary to clear pollen grains and minute wax particles from the strainer walls, as, though no more than 2 degrees of heat is lost between the time the combs are removed from the hot room, pricked, and extracted until they reach the strainer, the consistency of manuka honey makes it impossible to maintain the free flow of the lighter honeys. Straining can be carried out with maximum efficiency if the honey reaches the strainer at a temperature of between 88 to 90 degrees F. and is not held up in the strainer to a point where a drop in temperature might be expected.

Whereas in the past the strainer has been suspended above the honey tank or submerged in it, it is now considered preferable to have the strainer at floor level near the extractor. Attention to the strainer in this position becomes simple. It rests in a low tank, the honey being pumped from the extractor into the strainer, and from the shallow tank by a second pump into the settling tanks.

Extractors

Radial extractors are useless for handling manuka honey. Two-frame extractors are of little avail, as they lack balance and cannot be driven at a sufficiently-high speed. Four-frame extractors can be used, but do not give complete satisfaction because the circumference of the drum is inadequate.



[*Sparrow Industrial Pictures Ltd. photos.*

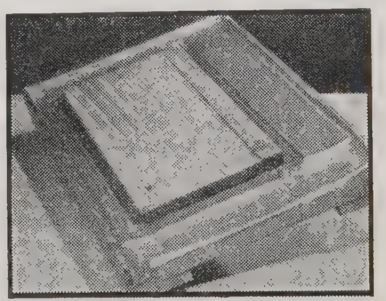
Inserting and withdrawing the pricker pad from a comb of manuka honey.

The ideal machine for this class of work is the 8-frame reversible basket extractor. It can be run as fast as 250 revolutions per minute, but care must be taken that the speed is not sufficient to break the combs. However, the operator should be able to judge the necessary speed and what the maximum rate should be.

Treatment in Settling Tanks

After leaving the strainer the honey should enter the settling tanks by being deflected by a board beneath the pipe and sloping to the side or bottom of the tank. This will allow the honey to flow gently down the side of the tank. Rapid cooling of manuka honey prevents imprisoned air bubbles from rising to the surface, so the honey should be held at a temperature of about 90 degrees F. for 3 days if possible.

Slow stirring, preferably by mechanical agitation from the bottom of the tank, helps to break up the jelly and force air bubbles to the surface if carried out while the honey is warm and liquid. At the end of the third day the honey should be skimmed to remove froth and debris. However, if a suitable heating and drying unit is not in use, skimming to a depth of 1in. is necessary to remove any moisture that may have accumulated on top of the honey, as well as froth and debris.



[*Sparrow Industrial Pictures Ltd. photo.*

One type of stand on which combs are stood for pricking.

Packing

After skimming, the temperature of the honey should be lowered to 75 degrees and 3 to 5 per cent. of fine-grained starter honey added. Fully-ripened manuka honey is slow to granulate, and the introduction of a starter is just as essential as in other honeys.

The honey should be stirred until the starter is thoroughly incorporated in it. If a small quantity of the honey is run from the gate of the tank into a small phial and when examined is found to have the crystals evenly distributed, the honey may be deemed ready for packing and can be run off into containers immediately.

THE HISTORY AND EVOLUTION OF SHEEP BREEDS

2. The Breeds of Great Britain

By I. S. MILLER, Sheep and Wool Instructor,
Department of Agriculture, Christchurch.

THOUGH the Merino formed the basis of New Zealand's sheep and wool industry, a number of the British breeds of sheep have changed the face of the industry in the past 100 years. In considering their development in Britain, sheep must be regarded as producers of wool rather than of meat, as the rise of Britain's commercial prosperity was based on her wool trade.

IN the House of Lords the Lord Chancellor takes his seat on the Woolsack—a reminder that the sheep was already an important animal in the manorial farming of medieval England. The keeping of sheep for wool was the earliest form of large-scale commercialised farming, and wool was the main basis of Britain's early export trade. All through the 16th century there was loud outcry about the enclosure of farms to form sheep walks, and the sheep came to be regarded as the greatest enemy of the small farmer and of the labourer in husbandry. In the later 18th century the sheep brought about economic revolution in the Scottish highlands and drove the people into the cities and overseas. However, there is a credit side to the account: The "golden hoof" has turned many a stretch of barren heath or down land into arable fields which have grown vast quantities of corn and have paid wages to many poor men.

Great Britain's sheep population during the past 80 years has fluctuated between 20 and 29 millions, but from 1885 to 1910 it always exceeded 25 millions. A rapid fall occurred during and just after the First World War. From 1923 numbers increased to 24 millions in 1939, but during the Second World War they decreased by more than 6 millions. This was a loss of nearly 25 per cent. on the 1939 figure, but by 1946 numbers were up to 20.4 millions again. The position was made worse by the storm losses of early 1946, and by June of that year the sheep population had declined to 16.7 millions, compared with nearly 27 millions in 1938. A recovery of some 2 millions was made by 1948, but this represents little more than the rebuilding of the hill flocks after the blizzards.

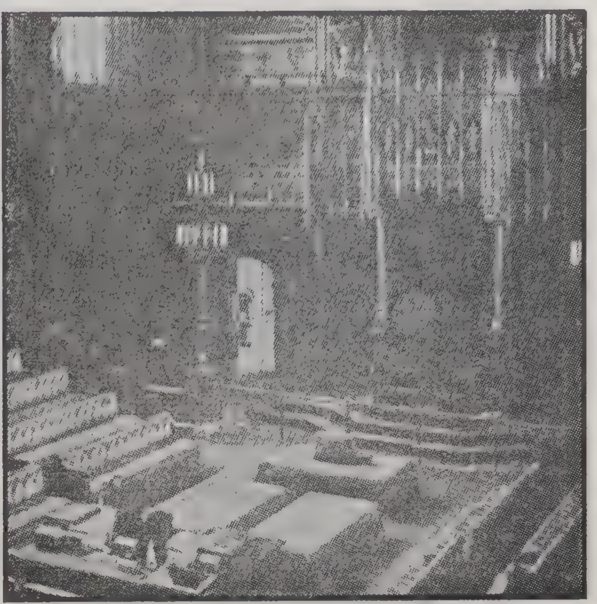
The first domesticated sheep are believed to have reached Britain with the Celtic tribes in the 6th or 7th century B.C. Whether there were sheep indigenous to the country is not known. However, these sheep (and for the purpose of this article they may be called "native" sheep) were "scruffy little animals." The Romans probably took to Britain from southern Europe larger sheep with better fleeces to improve the native flocks.

From Roman to Norman Occupation

When the Roman invaders landed in Britain 2000 years ago they found that the people of those islands could already dress, spin, and dye wool. Throughout their settlement and development of the country they encouraged the production and manufacture of woollen materials, as the climate made possible the production of a good-quality wool for the production of high-class material which was exported to Rome.

After the conclusion of the Roman occupation of Britain came a period when improvement was not maintained, though the more settled conditions which followed the Norman conquest enabled sheep breeding and wool manufacture again to make great headway, the centre of manufacture being Winchester. According to William Youatt, in the early days of the Norman kings a differentiation was made in wool types. Short, fine wools were used for the manufacturing of broad cloths, while the long wools were made into hosiery and woollen goods. The value of both types of British sheep was then understood and acknowledged.

The Middle Ages



[After Arthur V. May, "The Story of Wool."

Before the throne in the House of Lords stands the Woolsack, on which sits the Lord Chancellor—a reminder of the sheep's importance in the farming history of Britain.

Throughout the Middle Ages England gained considerable commercial prosperity as a producer and exporter of wool to many European countries. From the 12th century on England began to develop woollen manufacture, and for a long time the export of raw wool was prohibited. Flemish weavers were encouraged to settle in the country to teach and practise their art, and in three areas, East Anglia, certain western counties, and Yorkshire, the manufacture of woollen goods was of enormous importance. Doubtless many of the monastries which kept sheep on a large scale throughout the Middle Ages succeeded in bringing about improvements in sheep husbandry as in other phases of agriculture. "The multitude of sheep yield such fine wool, and so white, that it is coveted not only in other parts of this nation, but in foreign countries; but the inhabitants are so wise that they make such improvements in their wool that the sheep may be said to bear Golden Fleeces. . . ." (Quoted in "Great Farmers" by Professor J. A. Scott Watson and May Elliot Hobbs.)

From early times it appears that there were short-woolled and long-woolled sheep, with many nondescript types of more or less local characteristics. Under Edward III in the early 13th century mention was first made of the wool staplers, a name applied to a class of middlemen who bought directly from the grower at the farm or the nearest town, arranged the wool according to quality, and sold it to home manufacturers or foreign merchants.

Sheep numbers increased greatly in Britain throughout the 14th century as a result of the prosperity of the home manufacturer, and the supply of wool became greater than the home market could dispose of. The prohibition against exportation was then removed. Further, early in the 14th century the art of spinning worsted yarn, which appears to have originated at Norwich, made much progress and eventually the yarn was exported in large quantities. Worsted manufacture then spread throughout the country.

Change in Fashions and Fabrics

From about 1400 on, wrote Youatt, as a result of a change of demand in wools, Spanish wools became more sought after; fashions and the nature of fabrics changed. As a result it seems the character of the sheep probably changed, too, in France, the Netherlands, and England. The Romney Marsh, the Lincoln, and the Leicester began to be developed, and the older fine-woolled sheep were abandoned to a large extent because they could not compete with the celebrated Spanish Merino in fine-wool production.

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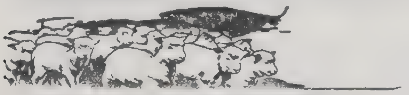

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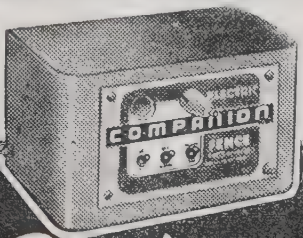

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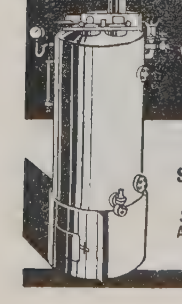

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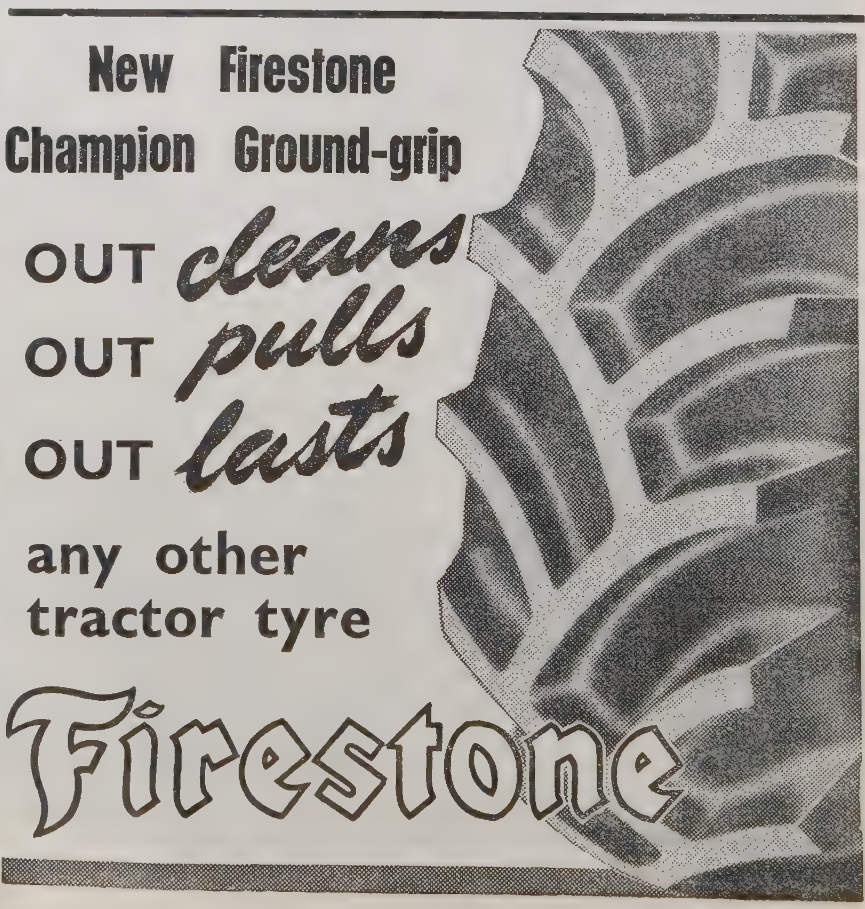
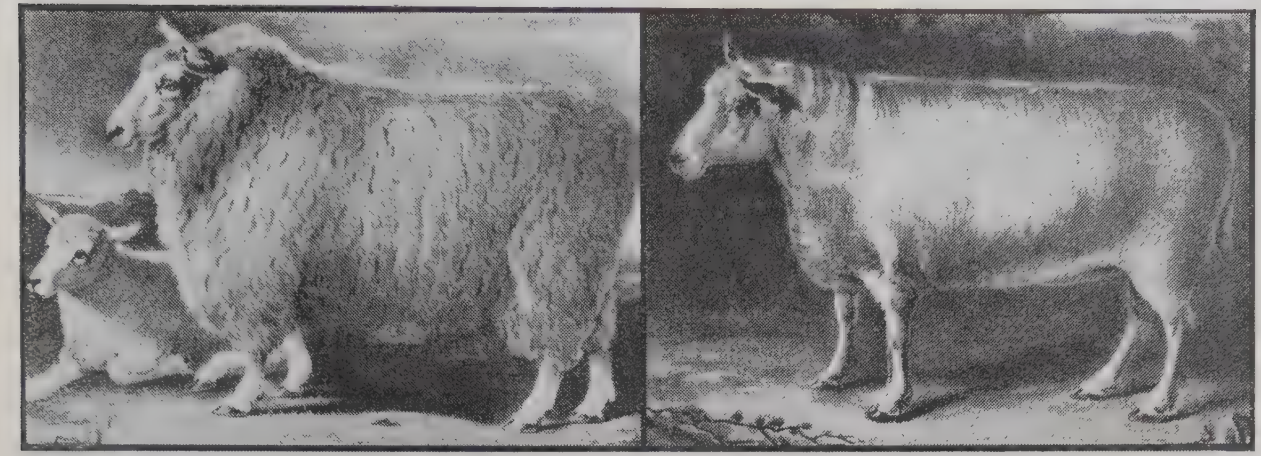


EVOLUTION OF BRITISH SHEEP BREEDS



[*After Professor Low, "Illustrations of the Breeds of Domestic Animals."*

Left—The Romney Marsh breed, 1842. Right—The New Leicester breed, 1842. For about 30 years preceding 1790 Robert Bakewell developed the first improved Longwool from the old Leicester type.

The long-wools were still decidedly superior to those of foreign origin, so attempts were made to export not only the fleece but the sheep. This threatened to improve foreign flocks at the expense of Britain, so Henry VI made laws to prohibit this export. Later, Queen Elizabeth enforced the prohibition more rigorously still.

During the reigns of Henry VII and Henry VIII, because of the distractions of religious dissension, lack of care in production and manufacture resulted in a deterioration of the quality of wool, while it seems that some of the old breeds of fine-woolled sheep vanished. Toward the end of Henry VIII's reign and during that of Queen Elizabeth attention was again given to the breeding of sheep and the manufacture of wool, and the export of fleece and fabrics increased tremendously. However, throughout the reign of the Stuarts wool manufacture fell on evil days, partly because of the prohibition on export and partly because of civil war. Countries on the Continent, including France, benefited by this and their manufacture and trade flourished. From the end of the 17th century the staple trade of England flourished and a greater number of sheep were bred.

The estimates in the table on this page were quoted by Youatt as being the results of various investigations by the authorities mentioned. These figures, though not accurate, are reasonable approximations.

New System of Husbandry

As population and commerce increased it was necessary that material for manufacture and food for workmen should increase proportionately, and so the 12,000,000 sheep of 1698, yielding one sort of food and material, had increased to 32,000,000 in 1834. There was a limit to this form of increase, however, and therefore a new system of husbandry arose—turnip husbandry, which enabled twice and sometimes thrice the number of sheep to be carried. How this came about is interesting.

Up to the 18th century the British regarded sheep as animals kept to produce wool, though ewes' milk and cheese were important as by-products of the sheep industry. Sheep in those days were not rated highly as flesh producers, and rightly so. However, apart from wool, sheep had another important function in the medieval agriculture of Britain—the maintenance of soil fertility on arable land.

Under the village farm system there were unfenced areas of tillage land cropped on three-course rotation—wheat or rye (winter corn), barley or pulses (spring sown), and then a fallow. By day the sheep of each village would go to the common grazings tended by the village shepherd, returning each night to be penned on the arable land. During summer they were penned at night on the uncropped fallow area, and in winter they used the stubble land until the spring-corn area was required for planting. Each owner provided fodder (such as straw and pea haulm) and material for fold or pen. In view of the large numbers of sheep kept in those days and the fact that no specific crops were grown for them they must have suffered appalling privation. Many allusions to heavy losses in sheep are made by early writers on agriculture. Sheep were sacrificed to the land to improve its cropping power through treading and manuring, bringing on to cropped land fertility from the common grazings which were not ploughed.

Change in Type of Wool

The 18th century brought a new outlook on the place of the sheep in the economy. With the rapid development of the industrial age came a rapid increase in population and an increased demand for food; a sharp fall in infantile mortality was the greatest single factor in this increase. In the same century occurred remarkable developments in farming practice and rotational cropping, using turnips and clover, which enabled farmers to develop sheep to produce flesh as well as wool. With this trend was connected the possibility of maturing sheep earlier and fattening them to a greater extent than before or increasing the size of the breed. A larger breed was preferred and developed almost everywhere.

At this stage a new situation arose which did not receive much attention:

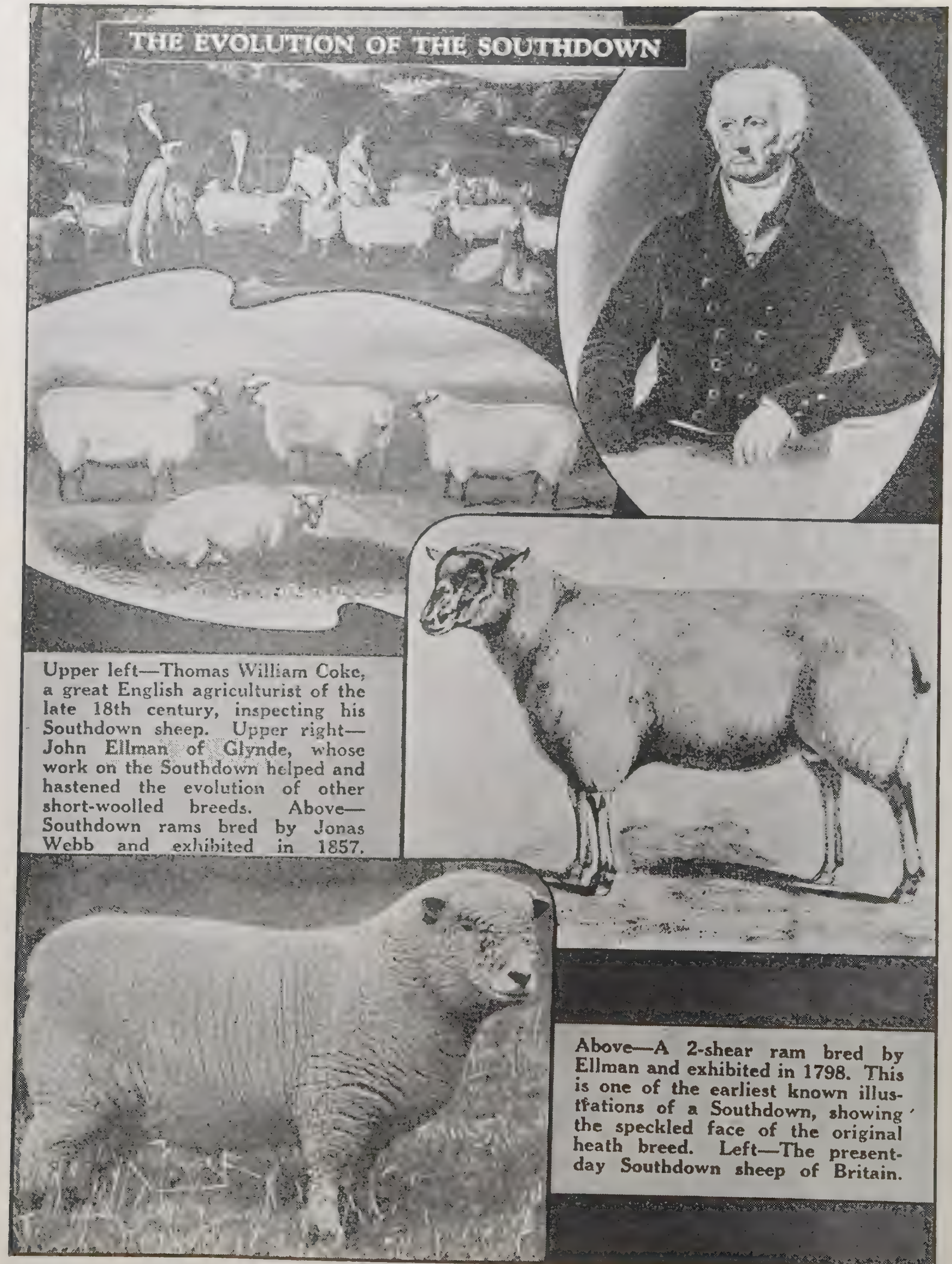
BRITAIN'S SHEEP POPULATION AND PRODUCTS

Authority	Year	Estimate of sheep numbers	Value of fleece (£)	Value of manufactures (£)
Gregory King	1698	12,000,000	2,000,000	8,000,000
Gregory King	1741	16,640,000	2,780,000	8,340,000
Arthur Young	1774	25,589,754	4,264,959	12,795,877
Luccock	1800	26,148,463	6,000,000	17,500,000
(Luccock estimated a total clip of 83,040,000lb., being 346,000 packs of 240lb. each.)				
Goodman and Hubbard ..	1828	26,148,463		
(Goodman and Hubbard estimated about the same number of sheep as Luccock, but corrected his figures for the weight of the wool clip because of the increased fleece weight—384,000 packs, including skin and slaughtered wools.)				
Professor McCullock	1834	32,000,000	7,000,000	21,000,000

Youatt (1834) disagreed with McCullock's estimate of the value of British wool manufacture. This is how he based his estimate:—

	£
108,000,000lb. of English wool at 1s. 3d. per lb.	6,750,000
46,535,232lb. of imported wool at 2s. 6d. per lb.	5,816,904
	12,566,904
Wages of 350,000 persons at £25 each	8,750,000
Wool dyes, oils, and other raw materials	1,450,000
Wear and tear of sunken capital, profits, etc. ..	4,250,000
Total value of manufactured articles	27,016,904

THE EVOLUTION OF THE SOUTHDOWN



Upper left—Thomas William Coke, a great English agriculturist of the late 18th century, inspecting his Southdown sheep. Upper right—John Ellman of Glynde, whose work on the Southdown helped and hastened the evolution of other short-woolled breeds. Above—Southdown rams bred by Jonas Webb and exhibited in 1857.

Above—A 2-shear ram bred by Ellman and exhibited in 1798. This is one of the earliest known illustrations of a Southdown, showing the speckled face of the original heath breed. Left—The present-day Southdown sheep of Britain.

[Bottom photograph from "British Pure-bred Sheep" (National Sheep Breeders' Association of Great Britain); others from "The Southdown Sheep" (Southdown Sheep Society)

If the carcass increased in weight, so did the fleece; the staple was longer and the fibre coarser. The manufacturer was the first to notice the change, but the farmer had not expected it, nor, apparently, would he believe that it was taking place in his own flock. It was left to the consumer to decide the question. Goods which at one time were sold readily were not disposed of. The buyer asked for cloth of Spanish wool only, and so for clothing purposes English wools receded in value. What was once a carding wool was becoming a combing wool, but was still of value for a different purpose. The wool had not deteriorated, but the type had changed, and Down-type wools had become modified too.

Influence of Merino

This tendency, which also occurred in almost every other European country, gave prominence to Spanish Merino wool—a type finer than British wool had ever been and yet which had never been sufficiently appreciated in Great Britain. To this influence was added that of fashion and of an increased demand from people who had made fortunes in industry and wished for fine clothing, resulting in a demand for a finer cloth than that to which people had been accustomed.

Youatt wrote that from an importation of 3,000,000lb. of Merino wool before 1800 it increased to 8,000,000 to 9,000,000lb. Then Saxony Merino wool of still higher quality was marketed, and importations rose further to 36,000,000lb. The British sheep owner suffered at first, but by 1836 all wool was in demand for some purpose or other and at a remunerative price to the grower.

Distribution of Sheep Population

There are no reliable records of the sheep population of Britain during the later Middle Ages, but areas once thickly populated with sheep now carry a sparse population, though there are now vast numbers of sheep in areas where they were once rare. There are several reasons for this:—

> The progress of industrialisation and urbanisation had a profound effect in lowering the density of the sheep population.
>
> Land such as in the Fen district and in Bedfordshire is more suitable for intensive arable farming, while Cheshire, Somerset, and Wiltshire carry a dense stock of dairy cows.
>
> All areas of high elevation are suited only to sheep grazing, and areas used predominantly for beef cattle also carry numerous sheep.

However, there are still further reasons. During the past 200 years the increase in the world's sheep population and the shift of a large proportion of this population from the Northern to the Southern Hemisphere with the opening up and development of new sheep-raising countries resulted in the availability of new supplies of wool, mutton, and lamb from these sources. In the face of this competition the British farmers were paid less for their sheep products, and where possible they tended toward other forms of farm production. All these factors had their influence in altering the distribution and concentration of sheep in Britain.

BRITISH BREEDS OF SHEEP

Group A—Mountain and Hill Breeds

Important	Scotch Blackface	
Local importance only	Swaledale Rough Fell	Breeds of the Pennine Range
Not important	Lonk Derbyshire Gritstone	
Virtually extinct	Limestone Penistone	
Important	Herdwick	Lake District
Important	Cheviot	
Important	Welsh Mountain	
Local importance only	Exmoor Horn	
Important only in the Shetlands	Shetland	

Group B—Intermediate Breeds which Link Group A with Group C

Kerry Hill (Wales) Clun Forest Radnor Forest	Breeds of the English-Welsh border

Group C—The Short-woolled Breeds

White-faced sheep with horns	Dorset Horn Wiltshire Horned or Western
White-faced sheep without horns	Ryeland Devon Closewool
Dark-faced sheep without horns—the Down breeds	Southdown Shropshire Suffolk Dorset Down Hampshire Down Oxford Down

The last-named is larger and longer in the fleece, thus forming a link with

Group D—The Long-woolled Breeds

Leicester
Border Leicester
Lincoln Longwool
Wensleydale
Cotswold
Kent or Romney Marsh
Devon Longwool
South Devon
Improved Dartmoor
Roscommon (native long-woolled breed of Ireland)

Multiplicity of Breeds

Even so, Britain maintains a greater sheep population than any other country in western Europe, and one of the principal reasons for this is the existence of much land in Britain which is more suited to sheep farming than to any other kind of agriculture. The history of Britain's development as a country of great commercial prosperity was linked with that of her wool trade. Now from the standpoint of its sheep breeds Britain is a museum. Though Merino types, which predominate in the world's sheep stock, have never gained a permanent foothold there, between 30 and 40 breeds are recognised in Great Britain. In addition there is an unaccountable assortment of crossbred sheep, certain types of which are of great commercial importance, but in some districts there exist many sheep of which as Thomas in his work "Sheep" says "mongrel" would be a mild description.

Why so many breeds in such a small country?

First, because sheep can adapt themselves to an extraordinary range of environment. Great Britain is small, but has great variations of elevation, climate, soil types, and herbage quality, though probably to a less extent than New Zealand. All these factors influence the growth and development of sheep, and before the formation of breed societies they caused the evolution of an incredible variety of local types mentioned by writers on British sheep more than a century ago.

A second reason for the wide range of breed types is that for more than 1000 years sheep were the most important livestock of Britain, and for 150 years men of individuality and keen judgment have developed recognised breeds from local types by cross-breeding and careful selection.

Probably yet another reason is that for a very long time Britain was notorious for the parochialism of her village communities; that spirit would tend to isolate local breed types.

The standard publication of the British Ministry of Agriculture, "British Breeds of Livestock," makes no reference to the relative numerical importance of breeds, but a census of production taken in 1908 showed that four British breeds made up nearly half the total sheep stock. The task of classifying the breeds is of necessity difficult, but the classification suggested in "Sheep," by Thomas and others, is given above.

This is rather a formidable list. Other local types have almost breed status, and some on the list given are now of very minor importance. The story of the development of British sheep breeds during the past 200 years makes complicated reading, but in the following notes only the more important breeds are discussed.

Mountain and Hill Breeds

The whole sheep industry of Scotland and the north of England is based on the two mountain breeds, the Cheviot and the Scotch Blackface, with various crosses superimposed on them, but each of these breeds has its sphere of influence. The Cheviot is a breed developed for grazing "green" or more grassy hill land, as distinct from the Blackface, which was developed for "black" or heather land.

The Cheviot, one of the most important breeds in Britain. It is the most cosmopolitan of breeds.

Cheviot and Blackface

The Cheviot's earliest known home was the border hills, but the Blackface probably originated in the Pennine region, where its relatives such as the Swaledale and the Lonk still live. The breed was well established in the southern uplands of Scotland as far back as the 15th century. Its invasion of the highlands is of much more recent date.

As a breed the Cheviot is good to look at, with a distinctive appearance, but it is not a good breed for wettish, lowland pastures. Other hill breeds are better adapted to withstand high-rainfall conditions. In Britain's eyes the Cheviot produces a good type of wool for a hill breed. Cheviot wool is naturally more soft and fine than Blackface wool and thus lent itself to improvement, becoming the raw material of the famous tweed industry of the Scottish borders. On the other hand, attempts to improve the long, coarse-textured fleece of the Blackface have resulted in a fleece lacking in protection in the rigorous conditions of its mountain country.

Apparently there was plenty of exchange of blood under the conditions prevailing along the border until the time of the union, and the breeds must have been mixed freely. Robson, of Belford and Bowmont Water, who was the first great improver of Cheviots, undoubtedly brought some sheep from the south. He is said to have used a ram from Bakewell, but his grandson held that after extensive travelling in England he bought several rams of a breed then existing in Lincolnshire. Robson's work gave the Cheviot a better carcass and an increase of 20 per cent. in fleece weight without loss of hardiness. This early gain of the Cheviots pushed the Blackface back to the highest and poorest land.

However, because of its hardiness and thriftiness the Blackface holds its own and apparently will continue to do so over a vast area such as the heather-clad hills of Scotland and the Pennine chain, on Dartmoor, and even on the Cornish moors. Men responsible for the early improvement of the Scotch Blackface were Gillespie of Douglas Mill, Charles Howatson of Glenbuck, and the Archibalds of Overshiels farming in Upper Lanarkshire and the inland part of Ayrshire.

The enclosure of the common land, which created much opposition in the Cotswolds in the 16th century, was repeated in the highlands between 1770 and 1840.

The forming of large sheep farms created a vast amount of human misery, equalled only by that caused by the industrialists of the new factories in the north of England.

The Blackface breed was the immediate instrument of this policy, advancing from the southern uplands to the southern and central highlands. The foreigners were more or less welcomed in the southern highlands about 1760, but in the north with their alien shepherds they were hated as the enemies of the old highland way of life. They had reached Caithness by the end of the 18th century, and when a disastrous outbreak of disease occurred among the goats and the little old soft-woolled Kerry sheep of the northernmost county in 1806-07 the Blackfaces were left supreme.

The rival Cheviots were not far behind with such champions as Sir John Sinclair, who by 1802 had 3000 of these ewes on his estate at Langwell, in Caithness. Rising prices for finer qualities of wool after 1800 helped their campaign.

The displacement of the crofters to new villages by the sea or abroad to the colonies was completed by the capitalist farmers from the neighbourhood of Northumberland moving in with their thousands of sheep, complete with shepherds and dogs. Professor Scott Watson gives some idea of the magnitude of the emigration when he says that one of these men, Reed, alone held a run in the Strath of Helmsdale which was 18 miles long by 8 miles at its widest, grazing more than 18,000 sheep.

The Dorset Horn, which will breed earlier in the year than any other type of sheep in Britain.

Herdwick

The origin of the Herdwick, the breed of the Lake District and of considerable numerical importance, is obscured in romance. The legend of 40 scraggy Merinos struggling ashore from a wreck of the Spanish Armada on the coast of Drigg can, it seems, be discounted. More probably they are the descendants of some Scottish sheep taken off a wreck on the Cumberland coast in the early 18th century and acquired by the farmers of Wastdalehead. Their owners regarded them with almost superstitious awe and formed themselves into an association with the main object, apparently, of keeping the Herdwick to themselves.

It is one of the most hardy and thrifty types in Britain. It is not akin to the Blackface breeds, though its fleece is very coarse textured. Some rams are horned and some polled. The outstanding feature of the breed is the change in face and leg colour from the dark of the lamb to grey and then with age to white.

Welsh Mountain

The modern taste for a small, fine-grained, lean joint in mutton and lamb has brought the Welsh Mountain breed more into prominence. This is the smallest British breed, descended from early types indigenous to the country—the original tan-faced, short- and dense-woolled Celtic sheep—and was long thought hardly worth improvement.

Wales has much high land on which the rainfall is heavy and the poor-quality herbage will support only a thrifty breed of sheep. Because of its suitability for this type of hill country, Thomas ranks the Welsh Mountain as of first-class importance and value. The Cheviot is polled in both sexes, but the Welsh Mountain rams are strongly horned. The breed would have a wider distribution in England but for one unfortunate disadvantage for the lowlander—its tendency either to burrow through poor fences or to take them in its stride.

Only in recent times have systematic efforts been made with the aid of science to fine down the wool while ridding the fleece of undesirable kemp fibres and still retaining a fleece that will keep the newly-born lamb warm and dry. To improve the fleshing of the breed while retaining its hardiness and thrift on the scant herbage is another aim. This is no easy task, and it seems that improvement of the hill pastures must accompany flock improvement.

Intermediate Breeds

For the purpose of this classification the group of intermediate breeds represents a transition stage between breeds developed for and kept on the highest land and the lowland breeds, short and long woolled. It appears that more could have been achieved in flock improvement in this limited area if breeders had concentrated on the development of only one breed. As it is, none of these three breeds—Kerry Hill, Clun Forest, and Radnor Forest—is of great importance.

Short-woolled Breeds

The majority of the short-woolled breeds are associated with lowland farming systems or arable farming on

The Ryeland, a very old breed. It is a fairly-small and very docile sheep.

[All photographs on this page from "British Pure-bred Sheep" (National Sheep Breeders' Association of Great Britain).

light-soil uplands of chalk and limestone. Of this group only the six Down breeds have something in common except shortness of staple.

Dorset Horn

The old Dorset Horn breed represents the nearest approach so far to the production of a crop of lambs twice a year. The Dorset Horn will breed earlier in the year than any other type in Britain, for the ewes take the ram in May (late spring), lambing in October (late autumn). Thus, Dorset Horn flocks are lambing when most English flocks are being mated, and so provide fat lambs from December onward. The ewe also will produce lambs at shorter intervals than a year.

The Dorset Horn is a breed of great antiquity, but as far as is known it has not been subjected to infusions of other blood, Leicester, Southdown, or Merino. It is distinct from other British breeds in that its lips and nostrils are flesh coloured, not black. The wool is very white. It is not a breed for a cold, wet climate, but is found mainly in south and south-west Dorset, Somerset, and the Isle of Wight. In carcass quality and conformation the breed is not up to the standard of the Down breeds.

Ryeland

Perhaps the rather chequered story of the Ryeland might have been more noteworthy if there had been an Ellman or a Jonas Webb to try his skill at breed improvement in Hereford. The Ryeland, too, is a very old breed, descended from the small sheep kept in the Ryelands district of southern Herefordshire and noted for their fineness of wool. Professor Scott Watson says the breed was the favourite of "Farmer George" (King George III) and quotes him as saying he "wanted no better sort of foreign sheep than the true Hereford Ryland."

However this may be, George III's very real interest in the Spanish Merino certainly led to a good deal of crossing with the Ryeland, but it appears that, apart from some slight cross with the Leicester, the Ryeland is very similar to the ancient breed.

The rage for Shropshires and other Down breeds threatened the Ryeland even in its home county until in 1903 only 30 flocks were left. However, determined efforts by some breeders increased the demand and the Ryeland flocks, and the breed joined in the competition for early fat lamb production. The Ryeland is now of no pronounced importance in any particular district in Britain.

The Ryeland is fairly small, very docile, and unless kept on second-class land tends to put on too much fat for present tastes. The fleece is white and fairly uniform in quality. The rams are in some demand for cross-breeding.

The Shropshire, which is now more important and better known in other countries than in England.

Southdown

In this article the name of John Ellman, of Glynde in Sussex, is associated with that of Bakewell. Starting with different raw material and working under different conditions, Ellman produced a very different new breed of sheep. The Southdown bears the same relationship to other Down breeds as the English Leicester bears to the long-woolled breeds. Therefore pride of place must be given to the Southdown in dealing with the Down breeds.

The local breeds which roamed the downs are described as small and ill shaped, with a very short and light fleece of indifferent quality. This was the type on which Ellman began his life's work toward the end of the 18th century. Ellman's object was different from Bakewell's: He wanted a sheep that would thrive on the poor, dry downlands and that would yield, not a heavy carcass with a superabundance of fat, but a choice quality of fine-grained meat. It appears, too, that his methods were different in that he avoided close in-and-in breeding. Glynde Estate and its master soon became famous for the mutton qualities of the Southdowns.

The Suffolk, which is more widespread in Britain than any other Down breed because of its popularity for cross-breeding.

In the early years of the 19th century there was no royal show and the main farmers' gatherings were the annual sheep shearings. There were many such gatherings, but two of the most notable were those held at Holkham and at Woburn. These estates were also noted for their Southdowns, for in 1790 Ellman had persuaded Coke of Holkham, a great agriculturist, to replace his old Norfolk Horned breed with the Southdown. At about the same time Francis, Duke of Bedford, gave the breed a trial at Woburn; a purebred flock was established there later.

However, it was Jonas Webb of Babraham who carried on the Ellman tradition. He started life as manager for Mr. Adeane of Babraham, and there he first met Ellman, who was at the height of his fame at Glynde. Webb struck success rapidly after leasing a farm at Babraham and buying from the chief Sussex breeders. After Ellman retired in 1829 Webb took the lead, and he is said to have retained constitution and wool, though he could not stand a "muffly-faced sheep." The Babraham flock was auctioned in 1861, the year before Webb's death, and the 1404 sheep realised a total of £16,646. A statue was erected in Cambridge to his memory; the inscription is simple—"From farmers and friends in many lands." Jonas Webb was one of the very few great farmers to whose memory a statue was erected.

The Border Leicester, which, mated with the Cheviot, produces the half-bred, Britain's most famous type of cross.

The influence of the Southdown has been very wide, both in the development of the other Down breeds and in lamb- and mutton-raising flocks overseas.

Shropshire

The original parent stock of the Shropshire largely roamed the hills and commons of Shropshire and Staffordshire. They were Morfe Common sheep, those of the Longmynd, and those of Cannock Chase. From the blending of these sheep with a cross of Southdown brought in by Samuel Meire of Harley in 1810, the Shropshire was evolved.

The modern Shropshire is a very different animal from those exhibited by Meire and Adney at royal shows from 1853 to 1856. The skill of Shropshire breeders of the past 70 years has changed the speckled face to one of soft black, improved the carcass out of recognition, and turned the wool that was once open into a dense, fine staple. The excessive woolliness of the head has told against it for cross-breeding. It is now more important and better known overseas, for its popularity in England has declined in recent years.

Suffolk

The transformation of the Old Norfolk Horned breed into the Suffolk is another instance of the influence of Ellman's Southdown. Arthur Young and a tenant farmer of his were largely responsible for early experiments with the cross. The Suffolk had inherited something of the activity of the Old Norfolk, but it was combined with a better carcass and the earlier-maturing qualities of the Southdown. By the middle of the 19th century flocks of pure Norfolks were rare, for most of the sheep were crosses of varying degree. However, the new Suffolk type was being fixed by the continued careful selection of such men as George Dobito of Cropley Grove.

[All photographs on this page from "British Pure-bred Sheep" (National Sheep Breeders' Association of Great Britain).

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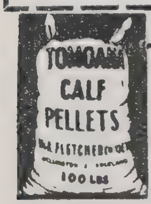

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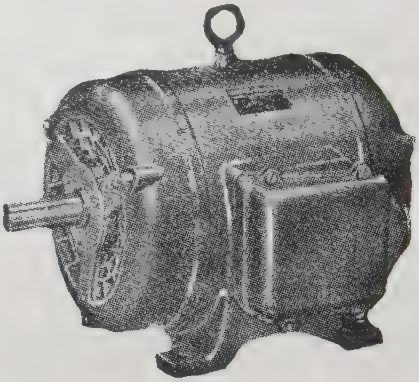

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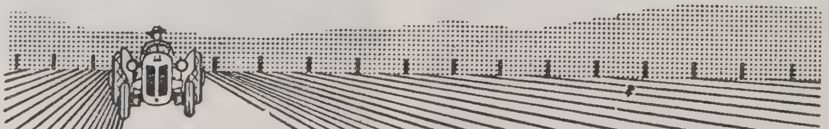

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The Suffolk, though originally bred for East Anglian arable farms, is now more widely scattered through Britain than any other Down breed because of its great popularity for cross-breeding. It is a striking sheep with its black face and legs, and in contrast to the Shropshire the wool does not extend below the knees and hocks or on to the head. It is more prolific than most Down breeds.

Hampshire Down and Dorset Down

There are now many more Hampshire Downs in Wiltshire than in Hampshire, but their ancestors were the old scraggy Wiltshire Horns and Berkshire Knots. About 1840 a Mr. Humphrey experimented with the use of Southdown rams on this stock, finally buying rams from Jonas Webb—in fact, one of them was a son of Webb's great sire Babraham. The rams were mated to the biggest of the ewes and left some good progeny which founded the breed." Humphrey was later able to exchange rams with one Saunders from about Dorchester, who had been breeding along the same lines, but Saunders's type in time became not Hampshires but Dorset Downs.

The Dorset Down is a type similar to the Hampshire Down, though slightly smaller in size and lighter in face and leg colour. In its home district of the counties of Dorset and Somerset it is quite a valuable commercial type.

Like the Dorset Down, the Hampshire is a breed peculiarly suited to the arable-land sheep farming of the southern chalk uplands. It is a large breed with brownish-black face and leg colour, woolled down the legs, over the poll, and on the cheeks. Its most important feature is its capacity to make very rapid liveweight gains when heavily fed.

Oxford Down

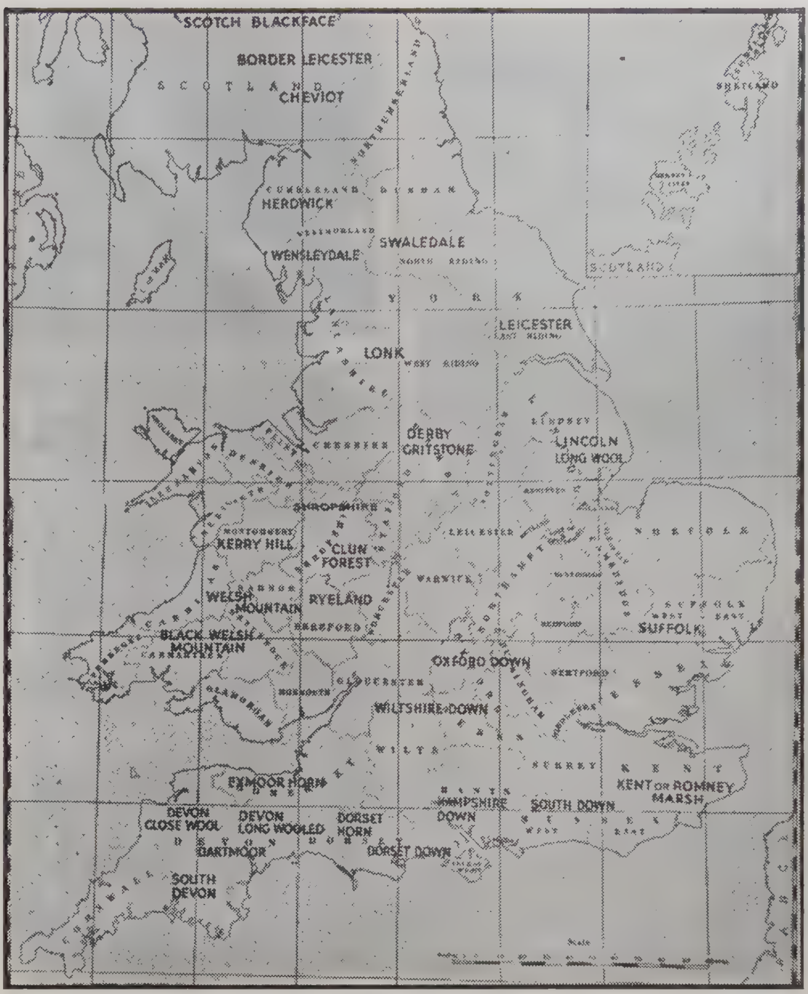
The origin of the Oxford Down is interesting. In 1829 John Twynam, who had a flock of Hampshire ewes at Whitchurch in Hampshire, was visiting a farm with a neighbour. They came on a flock of Hampshires like his own, but half the lambs were by Cotswold sires, the other half being purebred. He was so struck with the increased size and condition of the crossbreds that eventually he carried on the cross-breeding on a large scale. Many other breeders followed suit, some buying his crossbred rams while others bred their own, and eventually they were able to fix the new type. The Oxford Down replaced the Cotswold in its own district.

It is the largest of the Down breeds and has a longer fleece. Compared with the Hampshire Down, it is more hardy and better suited to cold, wet, arable land. Like the Suffolk, the Oxford Down now has a scattered distribution because of the demand for rams for cross-breeding in the Midlands and the border counties.

Long-woolled Breeds

As purebreds the long-woolled breeds are much less in demand than 50 years ago and therefore are less important. The importance of wool in relation to early maturity and fleshing properties has declined except in breeds like the Romney Marsh, for which there is still an export trade to the wool-growing countries. Mutton now must be small and lean, for consumers' tastes have changed.

DISTRIBUTION OF SHEEP BREEDS IN BRITAIN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HEREFORD
SUFFOLK
BLACK WELSH
MOUNTAIN
CARMARTHEN
OXFORD DOWN
HERTFORD
GLOUCESTER
GLAMORGAN
WILTSHIRE DOWN
WILTS
SURREY
KENT
EXMOOR HORN
KENT OR ROMNEY
MARSH
DEVON
CLOSE WOOL
DEVON
LONG WOOLED
DORSET
HORN
HANTS
HAMPSHIRE
DOWN
SOUTH DOWN
DEVON
DARTMOOR
DORSET DOWN
SOUTH
DEVON
CORNWALL
Scale

[*From "British Pure-bred Sheep"* (*National Sheep Breeders' Association of Great Britain*).

The long-wools produce fleeces of 10 to 15lb., long in the staple, lustrous, and large in fibre diameter. The demand and price for this type of wool have fallen in comparison with other types, so there has been a trend away from long-woolled sheep, and among those that remain cross-breeding has become increasingly prevalent. On the rich lowlands, however, the long-wools still hold their own.

> **Children hear a spate of praise for great poets, great engineers, great soldiers and sailors, but the fame and honour that are due to great farmers are not so loudly sung. That appears strange in view of the work of such men as Robert Bakewell of Dishley and John Ellman of Glynde—"by their patience and determination they showed the world how to establish improved types of sheep."**

Professor Scott Watson in 1936 put the position concisely: "The indirect influence of Bakewell's sheep is still very great, for many of our modern breeds owe a great deal to Dishley blood. It was a belated honour to Bakewell's memory when a few years ago his grave in the little ruined chapel at Dishley Grange was restored and a tablet was erected to his memory."

New Leicester

Dishley Grange, in Leicestershire, was the home of Robert Bakewell, who developed the modern sheep. During the latter half of the 18th century the population of Britain increased rapidly and improved methods of farming allowed sheep to be fattened throughout the winter and spring, when previously they had barely subsisted, leading to the great change in breeding policy and the increased importance of meat over wool. For about 30 years before 1790 Bakewell developed the first improved long-wool from the old Leicester type, changing the old coarse-boned, slow-feeding animal into the symmetrical, fine-boned New Leicester.

Bakewell's Leicesters in time became very famous, and rams which he bred were used to improve existing localised long-woolled types. His methods of breeding and the example he set in the results he achieved were even more important than the type he produced. He was the great pioneer of inbreeding, careful selection, and the application of the progeny test to the sire. Before Bakewell died in 1795 New Leicesters were to be found in most of the counties of Great Britain and in several Continental countries.

The English Leicester is a medium-sized long-wool, blockily built and producing a good type of fleece. Most purebred flocks are now in east Yorkshire and Durham, but it has been a very famous breed abroad.

Border Leicester

The Border Leicester is a Cheviot-like edition of the previous breed, from which it originated. Two brothers, Matthew and George Culley, who had been pupils at Dishley, went to farm in Northumberland, taking Dishley sheep to found a flock. They followed Bakewell's practice of hiring out rams, watching the result, and using the sires in the home flock if they proved successful. Many local farmers on both sides of the Tweed followed the Culleys' example and with them continued to go back to Dishley when they wanted fresh blood. Gradually the local breeds of sheep were crossed out of recognition with Leicester rams, and later the Border type emerged as distinct from the English Leicester.

It is a breed of naturally-high prolificacy and, with its high carriage of head and strong, aquiline nose, the Border Leicester has quite an aristocratic appearance. The breed is of vital importance because of the value of the ram in cross-breeding; mated with the Cheviot it produces the half-bred, Britain's most famous crossbred, and it is also important for crossing with black-faced breeds, producing the so-called Greyface or Mule.

[*From "British Pure-bred Sheep" (National Sheep Breeders' Association of Great Britain*).

The Lincoln Longwool, which is the largest breed of sheep in Britain and produces the longest fleece.

Most purebred flocks are in the Scottish lowlands and Northumberland. As long as the half-bred ewe (the Barmshire of Yorkshire) retains its popularity for lowland pastures, the parent breeds—the Cheviot and the Border Leicester—must remain very important in the sheep farming of the north country. Down-type rams, principally the Oxford and the Suffolk, are used on half-bred and Mule ewes to produce fat lambs, and now this system of sheep husbandry has spread far to the south.

Lincoln Longwool

The Lincoln Longwool had an ancient reputation for the length and strength of its lustrous wool and was an early rival of Bakewell's Leicester. It has been bred by six or seven generations of sheep experts for size and frame, weight of meat, and weight of fleece, and it is the largest breed in Britain, if not the world. It used to be kept extensively on the high wolds of Lincolnshire and was developed for arable-farming conditions. From lowly beginnings it reached world fame by the end of the 19th century, and in 1906, 6928 stud sheep of the breed were exported. However, that day is gone, though the Lincoln contributed to the development of the Corriedale in New Zealand.

Kent or Romney Marsh

In the export trade the Lincoln had a rival in the Kent or Romney Marsh breed, for which there is still some demand in the wool-producing countries overseas. From the point of view of numbers it is Britain's most important long-wool. The breed is reputed to be traceable in the local records back to the 15th century. It was developed for a unique area of rich but exposed grazing land—the Romney Marsh, in the south-west corner of Kent. Here, too, breeders appear to have been influenced by Bakewell's example, though they did not use Dishley blood. Though seldom found outside the south-eastern counties in England, the breed played a great part in building the fat lamb-raising flocks of the world, including those of New Zealand.

In build it is very compact and short on the leg, and its wool is shorter, denser, and finer in quality than that of the other long-wools. Quite early it found a second home in the North Island of New Zealand, and now it is said that the Romney breeders of the Dominion have nothing to learn from Kent.

"The Stud Farm of the World"

Britain has been called the stud farm of the world, and certainly some of the British sheep breeds have been supreme for flesh production. Now the average Briton who thinks of sheep at all thinks of them primarily as producers of mutton and lamb, but wool is still important as an agricultural product of Britain—in fact, it is one of the few agricultural products exported.

Because Britain keeps sheep under such a wide range of environment, she maintains a great variety of breeds and has an even greater variety of crossbreeds, many of which are of proved commercial value for slaughter or as breeding stock. British breeds tend to become fewer, some having failed to endure the test of time and changing conditions. Perhaps in the future as New Zealand's sheep industry becomes more specialised and intensive a greater diversity of breed types will be developed.

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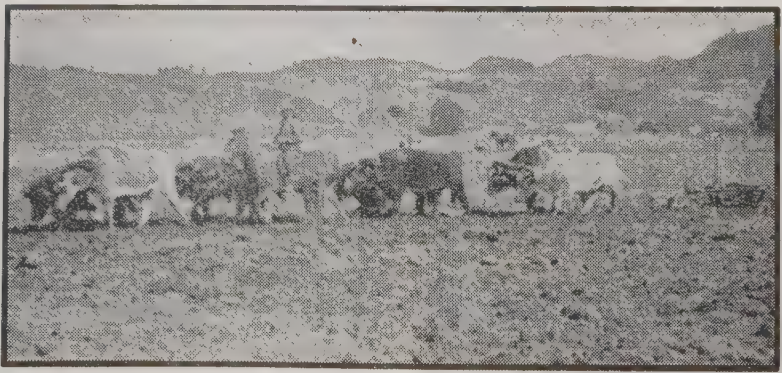
Bullock Teams in Maori Agriculture



THIS photograph of a Maori discing with a bullock team was taken in the Punakitere Valley, Hokianga County, North Auckland. In the same field two other primitive agricultural methods were being employed—opening up a furrow with a 1-horse single-furrow plough and hand planting of maize in the furrow.

The Maori in control of the team was very skilful in his handling and did all of it by low-voiced instructions to his bullocks without recourse to the whip. He explained that the land had been ploughed by bullocks using a bigger team than that employed for the discs. When not used on farm work the bullocks worked in the bush hauling logs for the mills.

—*I. J. Cunningham, Superintendent, Department of Agriculture Animal Research Station, Wallaceville.*

LETTUCE CULTURE

LETTUCE, the most popular salad vegetable, has a place in most home gardens and is grown extensively by market gardeners. It is, however, sensitive to both unfavourable climatic and soil conditions, and the precautions necessary in its culture are outlined in this article by W. G. Crawford, Vegetable Instructor, Department of Agriculture, Dunedin.

LETTUCE thrives best under comparatively-cool climatic conditions and requires ample moisture, two factors which have localised commercial production for early and main cropping, as low temperature and moderate growth are essential for good heading. Two main plantings or sowings are made commercially—one during early winter (just before frosts are experienced) and the other in early spring. When young, lettuces will stand fairly-heavy frost, but when approaching maturity are readily damaged.

Soil Preference

Though lettuce is grown on practically all types of soils ranging from clay loams to sandy loams, best results are usually obtained from fertile loams that are supplied with plenty of organic material and are well drained but able to retain moisture, as the plant has a relatively-small root system. Sandy loams are generally considered ideal for early production and the heavier type of soil is preferred for main cropping.

Thorough preparation of the soil is essential for successful production. Drainage, tillage, harrowing, rolling, and later levelling of the land into beds when necessary are important. The thoroughness of the preparation of the soil before planting or sowing will largely determine the ease and efficiency of later cultivation.

Reaction of soil for lettuce should range from pH 5 to pH 6.7. The amount of lime applied should not exceed the requirements of the soil.

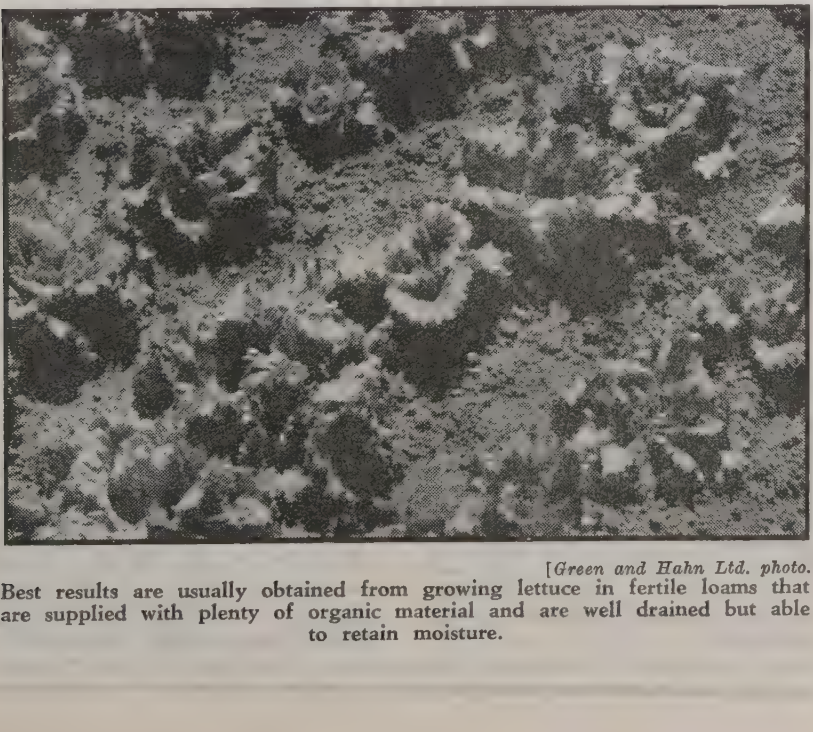
Manures and Fertilisers

Having a small root system, the lettuce plant is a relatively-poor forager, and it is therefore necessary for the surface soil to be well supplied with plant nutrients and humus. On land in which fertility has been well maintained and where soil-improving crops such as lupins and oats have been grown lettuce may be grown as a catch crop, using the residual nutrients in the soil. However, when lettuces are grown in this way there must be sufficient nutrients in the soil, as an inadequate supply reduces both quality and yield.

Fertilisation practices are best planned in accord with local advice and experience of previous crops grown in the soil. Where it is available natural manure can be used to advantage, but artificial manure should be used to supplement it. When soil-improving crops only are used as a means of humus supply applications of artificial nutrients should be greater. Light, sandy soils generally require larger applications than heavier types.

When composted and properly rotted down before being applied to the soil the best fertiliser for lettuce is probably farmyard manure. In this condition it can be spread over the surface and lightly harrowed in. If used fresh and unrotted, the material is coarse and interferes with planting or sowing and inter-row cultivation of the crop. Farmyard manure not only supplies plant food, but its organic material lightens heavy soils, thus improving aeration and water penetration, and increases the water-holding capacity of light or porous soil.

Sowing lettuce seed in well-prepared seed-beds.



[*Green and Hahn Ltd. photo.*

Best results are usually obtained from growing lettuce in fertile loams that are supplied with plenty of organic material and are well drained but able to retain moisture.

When manure cannot be obtained in sufficient quantities to supply both the plant food and organic matter green manure crops should be used in conjunction with commercial fertilisers. The green manure crop chosen should be capable of producing a good bulk under local climatic conditions and should preferably be a legume.

No hard and fast fertiliser programme can be recommended owing to the wide range of soil types in different districts, but in general it is a lack of available nitrogen in the soil that usually limits the growth of lettuce plants. Nitrogen can be supplied in the form of nitrate of soda, sulphate of ammonia, or in a slower-acting form such as blood and bone.

A complete fertiliser that has been used with success is made up of 6 parts by weight of blood and bone, 5 parts of superphosphate, and 3 parts of potash. When mixed this fertiliser is used on manured soil at the rate of 10cwt. per acre and on unmanured soil at the rate of 15cwt. per acre. Sulphate of ammonia or nitrate of soda can be applied as a side dressing after the plants have been thinned and until hearts start to form. Late applications of this quick-acting fertiliser often result in the heads of lettuce bursting open.

Bed and Row Cultivation

The three main systems for growing lettuce commercially in the field are the bed system, the single-row system on the flat, and the single- or double-row system on ridges.

The bed system is very popular with commercial growers, particularly

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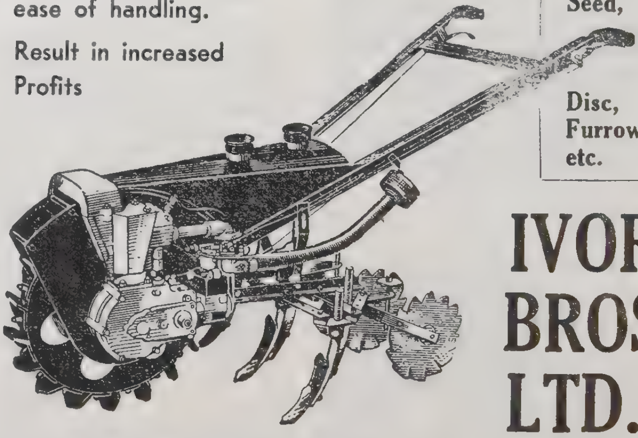

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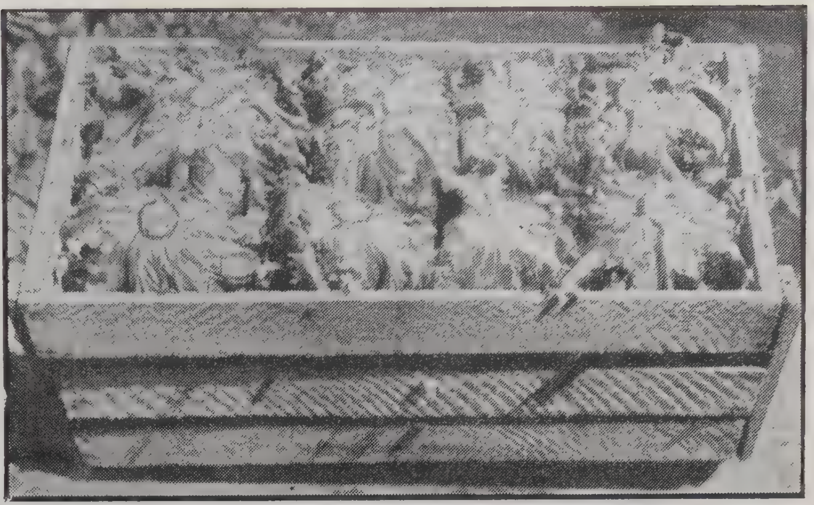


A well-packed case of lettuce ready for dispatch to the market.

those who grow crops for harvesting in early spring and late autumn. Raised beds are usually made 3 to 4ft. wide, depending on the type of machinery used, and several rows of lettuce are planted 8 to 10in. apart according to the variety grown. The beds and rows run in the same direction as the water flow of the land, or north and south where practicable. This bed-and-furrow system facilitates drainage and makes for better aeration about the plants. In addition, the extra headlands provided by the furrows between the beds enable the crop to be harvested more conveniently.

The single-row system on the flat, which is the orthodox method of planting in single rows, is used for the growing of main crops of lettuce for warm-weather harvesting. The rows are standardised according to the cultural implements used. Where large areas are grown plenty of headlands should be available at the harvesting period and for this reason breaks should be provided between every 30 or 40 rows of lettuce.

The single-row system on ridges is also adopted for the growing of early and late crops and provides the same advantages as the bed system. The ground is ridged as for potatoes. The ridges are firmed, generally with a turnip roller, and one or two rows of lettuce either sown or planted on the ridge.

Growing Plants for Transplanting

In the south lettuce plants suitable for autumn and summer transplanting are all grown in open beds and those intended for early-spring planting are raised under glass, usually in frames.

The seed-bed should be well prepared. The soil should be in good physical condition, friable, capable of holding moisture, not subject to crusting, and free of diseases. The seed should be sown thinly in rows 12in. apart. As the seed is small and relatively weak in comparison with cabbage and other similar types of seed, care should be taken to make the sowing as shallow as possible, with just sufficient soil to ensure germination. Thick seeding is not only expensive, but is detrimental to the production of good, healthy, and sturdy plants. Lettuce plants require a constant supply of moisture, but care should be taken to see that overhead watering is not overdone, as this is often the cause of plants being thin and spindly, particularly when grown under glass.

Planting Out

The transplanting of lettuce can be done in most districts at any time, provided the soil is in suitable condition and the plants have been properly hardened off when grown under glass. Only the best type of plants should be transplanted in the field, and the seed-bed should be thoroughly soaked before lifting the plants. Planting is all done by hand, usually with a trowel when the single-row system on ridges is used for transplanting, or a shallow furrow may be made with a hand cultivator when using the bed or single-row system on the flat. Lines should be perfectly straight to allow for inter-row cultivation of the crop, rows generally being from 15 to 20in. apart, with 8 to 12in. between plants. The spacing will usually depend on the variety of lettuce grown, but overcrowding should be avoided. When planting care should be taken to have the crown of the plants level with the surface of the soil.

Seed Sowing in the Field

For practically all autumn and summer cropping the seed is sown direct in the field. Sowing is done with either single, hand-operated, or double or more seeding drills operated by a small garden tractor. One and a half to 2lb. of seed is sufficient to plant an acre with rows 14 to 20in. apart, but if the rows are closer, more seed is required. Larger areas than can be comfortably managed should not be sown at any one time. Successive sowings of small areas extend the marketing period of the crop and provide a better distribution of labour in the field.

Thinning

Thinning is an important part of management and should not be neglected, as overcrowding leads to weak, spindly plants, which seldom develop into a good crop. Some growers as the first operation in thinning use a short-handled hoe to block out the rows and then complete the work by hand. The spacing is similar to that of transplanted lettuce.

Cultivation

As lettuce, being a shallow feeder and generally a poor forager, cannot compete successfully with weeds, the crop yield is usually increased by cultivation. Weed destruction is of prime importance in cultivating lettuce crops, but as the root system of the plant is small and close to the surface, hoeing should be done carefully. The soil should not be drawn up to the plants unnecessarily, as this tends to obstruct the air circulation around them and encourages diseases. If the soil has been properly prepared before sowing or setting out the plants, only very shallow hoeing is necessary. Soil moisture should be conserved by the maintenance of a mulch.

Varieties

Lettuce varieties are classified into four main types—crisp heading, cos, butter, and loose leaf.

Crisp-heading lettuce is in greater demand by consumers in New Zealand than any other variety grown.

Cos lettuce has long, narrow leaves with a pronounced midrib. The heart is compact and upright, but it is not hard. It is of little commercial value in comparison with the crisp-heading types.

Butter varieties are generally more flat or low lying than either the crisp-heading or cos types and are of very little commercial importance in New Zealand. The best-known variety of this group is Big Boston.

Loose-leaf types are generally vigorous growers, but are of little commercial value. The leaves are green with frilled edges.

Varieties which have grown well over a number of years include: Webbs Wonderful, Success, Neapolitan (summer and winter market), New York, Imperial, Cos White, and Champion Cos.

Diseases

Though lettuce crops are attacked by many diseases, only few are of sufficient importance to cause serious loss in the crop, but they are most difficult to control and some are beyond control by sprays. In fact, there are no truly-reliable control measures for any of them, as the nature of the growth of the plants makes it very difficult to apply the usual fungicides.

Botrytis Rot

Botrytis rot (*Botrytis cinerea*), which is also known as grey mould rot, is not of great importance, but is usually more serious in crops grown under glass. Plants may be attacked

DISEASES OF LETTUCE . . .

any time from the seedling stage to when they are approaching maturity in the field.

As high humidity favours the disease, preventive measures for plants grown under glass include regulating temperatures and ventilation and keeping the soil as dry as possible. Infected plants should be gathered and destroyed immediately by burning.

Spotted Wilt Virus

There is no known control measure for spotted wilt virus apart from removing affected plants. Affected plants become stunted and are often misshapen. Outer leaves show irregular brown spots which later spread to the heart leaves.

Collar Rot

Plants affected with collar rot (*Sclerotinia sclerotiorum*) rot at ground level as the result of the fungus. Symptoms when the plant is first attacked when very young resemble a common damping off. The disease on larger plants appears as a soft, darkened area on the base of the stem which develops rapidly under moderate temperature conditions. The optimum temperature at which this disease flourishes ranges between 60 and 70 degrees F. When the head has rotted off small, black sclerotia off the fungus may be found among the decayed mass. Infected plants should be removed and destroyed, care being taken to collect sclerotia.

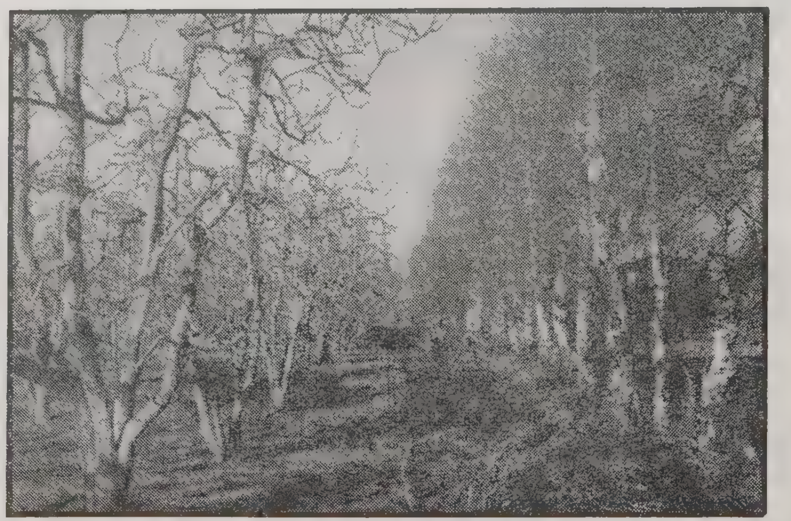
Downy Mildew

Downy mildew (*Bremia lactucae*) is one of the principal and most serious diseases with which commercial lettuce growers have to contend and heavy losses occur yearly in crops affected with this disease. It may attack the plant during all stages of growth and is of particular importance because it affects the edible leaves of the plant and during transit may predispose them to slimy rot. The first indications of the disease are slight yellowish patches on the upper sides of the leaf. A white mould soon appears below these coloured areas, on the under sides of the leaf, which later turns brown. With glasshouse crops, preventive measures should be taken to keep the foliage as dry as possible and temperatures low. Both glasshouse and outside crops should be sprayed with Bordeaux every 14 to 21 days, commencing in the seedling bed.

Ring Spot

Ring spot (*Marssonina panattoniana*) is a fungus disease appearing as small brown spots on the bases of leaves, giving the plant a shot-hole appearance. The affected tissues dry up and drop out. On the midrib of the leaf the sunken areas are irregular in outline. Control measures consist of spraying plants with Bordeaux at 21-day intervals until hearts begin to form.

Silver Birch for Orchard Shelter



[*News-photo Service photo.*

ORCHARD shelter is often a problem for fruit growers, because some of the best shelter trees, such as the poplar, rob fruit trees for 2 or 3 rows from the protective belt, sucker badly, and tend to grow too high, so that topping is difficult work. Two Hawke's Bay orchardists have used silver birch (*Betula verrucosa*) as shelter, with very satisfactory results.

The photograph shows a silver birch hedge 35 years old which was side trimmed from the outset. For the past 20 years each side has been trimmed alternately every 2 years. The belt was first topped when 10 years old and has been topped 4 times since—topping is necessary about every 7 years.

There are no breaks in this shelter—the trees were planted 4ft. apart—and it is very well furnished to ground level. It is sufficiently open to allow wind to drift through, which prevents any backwash caused by shelter that is too solid, such as *Cupressus lawsoniana*.

Silver birch does well on poor soils and is very hardy. Though it is a host for silver leaf, most deciduous trees are subject to that disease. A feature of silver birch hedges is that fruit trees can be grown close to them without being robbed of plant food or moisture. The row of pears to the left of the photograph, though only 24ft. from the hedge, have grown and cropped as well as the second row from the shelter belt.

—*R. I. JUNE, Orchard Instructor, Department of Agriculture, Hastings.*

Radio Broadcasts

RADIO talks to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates:—

October 5—"Current Farming Problems for the Month," by E. H. Arnold, Instructor in Agriculture, Department of Agriculture, Whangarei, and H. N. Jessop, Fields Instructor, Department of Agriculture, Warkworth.

October 12—"Home Orchard Problems," by I. L. Nottage, Orchard Instructor, Department of Agriculture, Auckland, and W. S. Kemp, Orchard Instructor, Department of Agriculture, Auckland.

October 19—"Quarantine for Imported Stock," by I. G. Watt, Veterinarian, Department of Agriculture, Auckland.

October 26—Young Farmers' Clubs' session, by a member of the Rotorua District Committee.

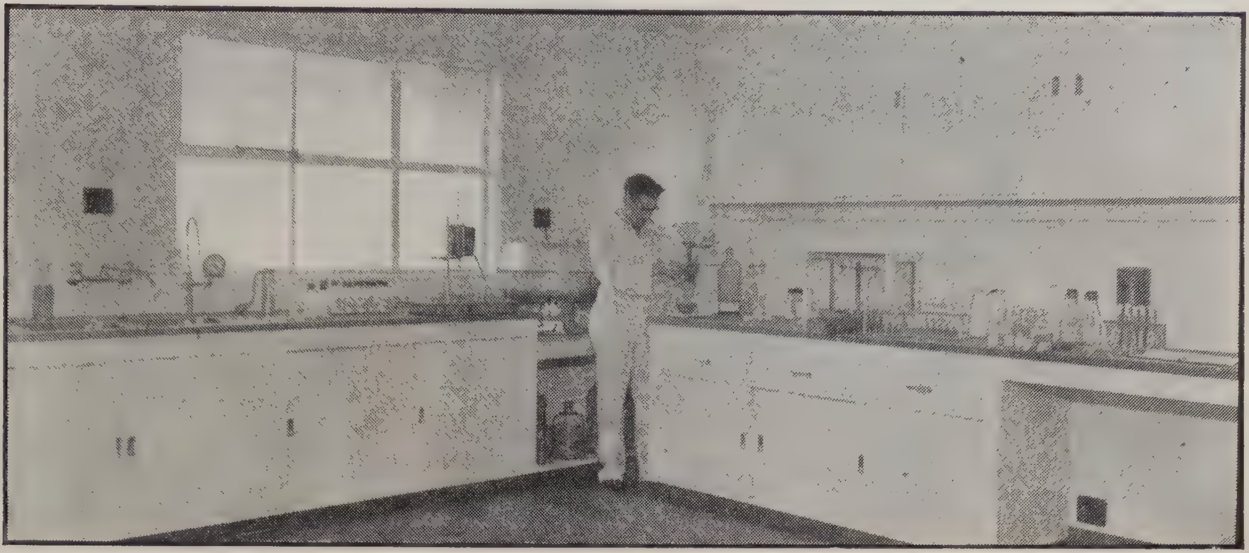
The following broadcasts will be made from 4YA Dunedin after the stock session at 7 p.m. on the dates shown:—

October 5—"Conditions Causing Rejection of Carcasses in Meat Inspection," by C. V. Dayus, Livestock Superintendent, Department of Agriculture, Dunedin.

October 19—"Departmental Activities Summarised," by C. V. Dayus, Livestock Superintendent, R. E. Binfield, Horticultural Superintendent, and A. G. Elliott, Fields Superintendent, Department of Agriculture, Dunedin.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 2YZ Napier on Thursdays at 12.40 p.m., 2YA Wellington on Thursdays at 12.35 p.m., and 3YA Christchurch on Mondays at 12.20 p.m.

Testing Market Milk for Keeping Quality



HEADING PHOTOGRAPH: A modern milk-treatment station laboratory. Jack Welsh and Sons photo.

THE Milk Act, 1944, was passed with a view to ensuring the provision for human consumption in New Zealand of an adequate supply of milk of the highest quality. In this article S. J. Cowen, Market Milk Instructor, Department of Agriculture, Palmerston North, describes how the methylene blue test is used by milk-treatment stations in helping town-milk producers to reach and maintain the high standard desired.

ONE of the results of the Milk Act was the formation of a Central Milk Council as a general guiding authority, and this, in conjunction with the establishment of producer co-operative milk-supply associations, gave both direction and stability to the town-milk industry as a whole. This meant that town-milk producers could concentrate on the production of a high-quality milk without having to worry about the vagaries of what in the past had proved an erratic market.

However, the organisation of town-milk producer co-operatives brought with it the difficulties inherent in a bulked milk supply. Fortunately, the milk-treatment stations which were the receivers of this supply took steps to ensure the testing of the quality of each consignment, and officers of the Dairy Division of the Department of Agriculture have been untiring in their efforts to ensure that this testing for keeping quality has been maintained regularly.

Necessity for Testing

When urban areas were small and the delivery of milk directly from farm to consumer was economically practicable there was little need for a keeping-quality test; if the milk did not keep, only one producer was affected and the consumer soon told him in what respect his milk was lacking. Where modern development in urban areas has necessitated the provision of central milk-treatment stations, as it has in New Zealand, this system of direct supply from producer to consumer has had to be superseded.

Under the new arrangement there is always the danger that one supply of milk of poor keeping quality may become mixed with the bulk supply of good milk in the milk-treatment station, and this could readily cause deterioration of the bulk supply. When the milk is delivered to the consumer it may give rise to a considerable number of complaints, many or all of which are made public only too readily. This causes adverse criticism of a scheme which is the only means of ensuring a supply of milk to consumers throughout the year, and also creates the general impression that all the supply is of poor quality, whereas most of the producers concerned are supplying first-class milk.

Bulked milk is only as good as the poorest milk in the supply, so to safeguard the producers of good-quality milk a system of testing every supply of milk received is necessary. Normally this is done by taking a representative sample of the milk received from each producer and testing it for keeping quality, and the keeping-quality test which has been adopted almost universally in New Zealand and which is used equally as widely overseas is the methylene blue or reductase test.

Before the introduction of the methylene blue test a direct method of testing keeping quality was used. It was usually carried out by holding a sample of milk at 60 degrees F. in a covered glass bottle; at intervals the milk was tasted, and in addition a small portion was boiled in a test tube and the appearance and smell noted. As soon as any abnormality of taste or smell or evidence of clotting when it boiled was noted, the life of the milk was considered to be at an end. Unfortunately, the result of this test could rarely be known before the milk had been delivered to the customers, and in this respect it failed to act as a corrective before the customer was inconvenienced. One advantage of this test was that it also picked out milk contaminated with non-bacterial flavours such as feed and absorbed taints; milk may have poor flavour but still be of good keeping quality.

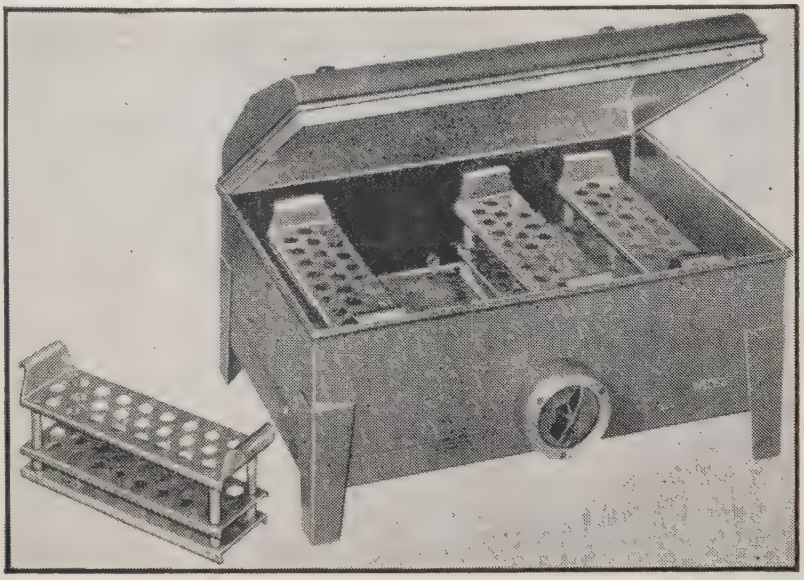
Obviously, it is essential that any system of testing for keeping quality be sufficiently rapid to ensure corrective action long before the customer receives the milk. This fact challenged scientists to seek a quicker method of obtaining such results, and as a result two scientists, Neisser and Wechsberg, developed the methylene blue test and introduced it in 1900.

Description of Test

Methylene blue is a dye which retains its colour as long as oxygen is present, but in the absence of oxygen changes to the colourless form of methylene white. As the bacteria usually found in milk consume oxygen, it will be seen that the more bacteria the milk contains the more quickly the dye is reduced in colour, and this speed of reduction provides the estimate of keeping quality.

For laboratory purposes methylene blue is usually bought in powder form. The stock solution is prepared by adding 0.1 gramme of dye to a flask containing 200 millilitres (ml.) of distilled water; after the dye has been dissolved a further 70ml. of distilled water is added, giving a stock solution of 0.1 gramme of dye in 270ml. of water. This solution may also be bought from dairy chemists, or the dye may be obtained in tablet form, packed in bottles

TESTING MILK FOR KEEPING QUALITY



A thermostatically-controlled electrically-heated methylene blue bath with removable racks for holding test tubes.

with instructions for preparing the solution. The stock solution must be stored in a dark cupboard.

To prepare the test a few millilitres of stock solution is poured into a sterile test tube and the stock solution returned to the cupboard. One millilitre of stock solution from the test tube is added to 9ml. of distilled water, and 1ml. of this solution is added to 10ml. of milk, giving a final concentration of 1 part of dye in 300,000. Excess dye should not be returned to the stock solution.

The glass test tube into which the 10ml. of milk and 1ml. of dye solution are placed is 6in. long and ⅝in. in diameter, with provision on the surface of the tube for marking the number of the sample. The tube also carries a small mark indicating the 10ml. capacity, which is convenient for measuring the milk directly into the tubes. For plugging the tubes rubber corks are normally used. The other equipment required for the test includes a supply of 1ml. and 10ml. pipettes and graduated cylinders and a constant-temperature bath, preferably provided with thermostatic control to ensure the maintenance of a steady temperature of 98 degrees F. during the test. These baths can be heated by electricity or by gas or spirit lamps, but in general practice baths heated by electricity are found to be most convenient. Inside the bath are racks to hold tubes. The bath is covered with a lid, as it is desirable that the test be carried out in the dark; some old-model baths had glass fronts, but because of the effect of light on the samples it was found necessary to paint the glass black.

It is essential that glassware and corks to be used for a methylene blue test be sterile. The glassware can be sterilised either by being heated in a dry-heat oven at 340 degrees F. for 2 hours or by being placed in boiling water and the water kept boiling for 10 to 15 minutes. The rubber corks used for closing the tubes when they contain the milk and dye are sterilised in boiling water.

After the samples to be tested are ready the procedure is as follows: Test tubes, racks, a basket of corks, tongs for handling the corks from the basket, pipettes, and methylene blue solution are all placed in a convenient position. Each sample is mixed, and either 10ml. of milk is pipetted into each test tube or milk is poured into the tube up to the 10ml. mark. Then 1ml. of the prepared methylene blue solution is pipetted into each test tube or run into it from a special burette, and the tubes are corked and inverted to mix the dye thoroughly through the milk. Each tube is numbered when the sample is added and then placed in position in the rack, which is numbered correspondingly; that ensures the maintenance of the identity of the sample from the producer. The rack of test samples is placed in the water bath and the water level maintained about the level of the sample of milk in the test tubes. The water temperature is controlled at 98 degrees F. within a tolerance of 1 degree, as this is the temperature considered most suitable for the reproduction of the bacteria usually found in milk. The test tubes are inverted every half-hour until the colour of the contents changes to white. The period between the start of the test and the time when the colour finally changes to white is expressed as the result of the test—for example, if a test started at 9 a.m. and the sample was reduced to white at 3.30 p.m., the result of the test would be 6½ hours.

A good-quality milk, from healthy cows and well cooled and handled under clean conditions, will contain comparatively-few bacteria and may not bring about a change of colour in 10 hours; milk of the same age but produced, cooled, and handled under unclean conditions will contain large numbers of bacteria and may change the colour to white in 30 minutes.

Milk that has been poorly cooled invariably causes a change of colour in a shorter time than if the same milk had been properly cooled at the time of production.

By regular testing and recording of results any variation in keeping quality is quickly noted. This information is passed on by the treatment station to the producer concerned and to the local Stock Inspector of the Livestock Division, Department of Agriculture, who assists the producer in locating and clearing up his trouble.

Producers' Responsibilities

The result of the methylene blue test is influenced by the number of bacteria present in the milk, which varies with cleanliness, temperature, and time. Therefore, to produce milk with good keeping quality every person handling milk must declare war on all bacteria to prevent their gaining admission to the supply. No amount of testing can absolve the producer from his responsibility in maintaining a high quality in the milk produced. If clean milk is to be produced, a definite routine must be observed:—

First, all cows milked must be healthy and clean. The cows should be properly prepared for milking by the clipping of all surplus hairs from the udder and thorough washing of the udder with clean water. The taking of a few streams of milk from each teat into a receptacle enables the attendant to examine the milk and in healthy cows removes a great source of bacteria by cleaning out the teat duct. Milk produced in such conditions will have a low bacterial count.

Second, all equipment with which milk comes in contact must be thoroughly clean, and that can be achieved only with a plentiful supply of hot water and the correct technique of cleaning the plant. This is explained in bulletins which can be procured free from the nearest office of the Department of Agriculture, and Stock Inspectors of the Department will readily give advice and assistance.

Third, milk must not be exposed to the atmosphere. Particles of dust floating in the air may fall into cans or on coolers, thus admitting unknown numbers and types of bacteria. Yards and surroundings should be kept clean and bails and yards thoroughly wet before the cows come in.

Fourth, milk should be reduced quickly to 60 degrees F. or cooler to preserve the natural flavour and improve the keeping quality. This requires a good supply of cold water. Bacterial growth is reduced considerably by cooling to 60 degrees, though bacteria cannot be killed by cooling, but merely remain dormant until the temperature rises. The low temperature should be maintained by keeping the cans in a cool, shady position. It is also in the producers' interest to insist that all milk-collection lorries be fitted with good covers so that their milk is delivered to the depot in good condition; the test sample is taken at the depot, and poor carrying conditions have a great influence on test records.

Assistance to Producers

The methylene blue test can be applied extensively in an advisory capacity, and any resentment of such testing is not in the best interests of a clean milk supply, as the results can be of great help to producers striving to attain perfection. The testing of every delivery of milk received at the depot under the same time and temperature conditions enables producers to be advised of any deterioration in keeping quality before the supply falls below the legal minimum test result of 4 hours set by Department of Health Regulations.

This requirement means that the milk must give a result of not less than 4 hours at the time of delivery to the consumer, and not just at the time of delivery to the treatment station, as some producers erroneously believe.

For this purpose it is necessary that all samples taken at the depot be held for a set period so that all are subjected to the same lapse of time between the normal milking hours and the start of the test. For example, samples taken from loads received early in the morning should be held until samples are taken from the last load delivered for that shift, thus placing all suppliers on the same basis.

It is advisable that samples collected during the morning milk delivery be held until 4 p.m. and then put in the cool-storage room at 38 to 40 degrees F. until the following morning. Samples taken during the evening delivery should be held at a temperature not exceeding 65 degrees and tests started by 8.30 the following morning. By this procedure all milk received from producers is subjected to the same conditions. Milk failing to comply with the 4-hour standard, because of unhygienic conditions or poor cooling, is identified and producers are advised so that they can take steps to remedy the defect on their own initiative or with the help of the local Stock Inspector.

Overseas and New Zealand Standards

Though the general quality of the milk in New Zealand is high, the methylene blue standards which are legally obligatory are markedly lower than those enforced overseas. In New Zealand the milk must not reduce the dye in 4 hours or less, and a milk of good keeping quality can give a result as high as 10 hours quite easily.

[*G. F. Framjee photo.*

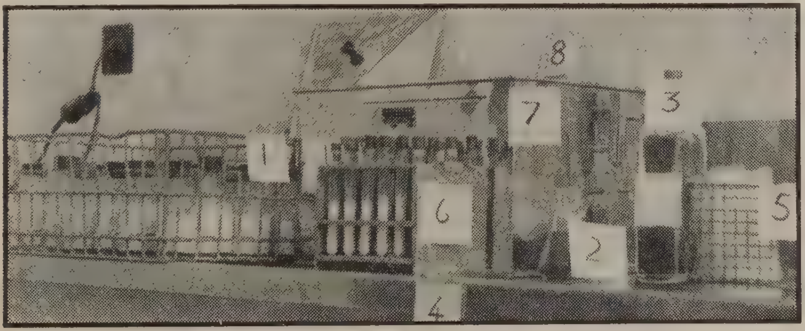
A corner of a laboratory with an incubator on the bench and an autoclave or pressure steriliser on the floor beside it.

In the United States of America methylene blue standards have been defined for different categories of milk, class 1 being of the highest quality and class 4 of definitely-low quality. The classes are defined as follows: Class 1, not decolorised in 8 hours; class 2, decolorised in less than 8 hours but not less than 6 hours; class 3, decolorised in less than 6 hours but not less than 2 hours; class 4, decolorised in less than 2 hours. Classes 3 and 4 are not of market-milk standard, which is interesting in view of the lowness of standards in New Zealand, though the general quality of milk in the Dominion certainly is not lower than that normally attained in America.

In England the standard required for good-quality raw milk is as follows: Samples are held at atmospheric shade temperature for 24 hours after production and when tested must retain their blue colour for not less than 4½ hours in summer and not less than 5½ hours in winter. When evening milk is sampled it is held until 5 p.m. on the day after production and, if it is not convenient to start the test then, the samples are placed in cold storage at 40 degrees F. until the following morning. The regular system of ageing the samples practised in England makes for a stricter test than the one used in New Zealand, but the required standard is not less than 4½ hours, compared with the New Zealand standard of not less than 4 hours for un-aged samples.

No matter how high the standard were set in New Zealand a large proportion of producers would comply continually, and that is to the credit of the main body of town-milk producers generally. No town-milk producer should be satisfied if the milk-treatment station informs him that his milk just passed the legal standards—that is, gave a result of 4½ or 5 hours. By overseas standards that is a poor result, and any producer not attaining a standard of at least 6 hours should realise that there is something wrong in his method of production or in his method of cooling. Cooling by itself will not remove trouble caused by lack of cleanliness anywhere in the line of production, and the methylene blue test properly used quickly shows up an unwise town-milk producer who may be depending on mechanical refrigeration to cover other defects in production.

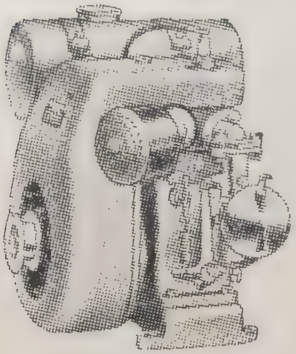
The methylene blue test is invaluable to the producer, to the milk-treatment station, and to the consumer. It is in the interests of every town-milk producer to ensure that his milk is being regularly checked by this test at the treating station to which he sends his milk. Failure on the part of the milk-treatment stations to use the test is really a breach of moral responsibility to the producer on the one hand and to the consumer on the other.



[*G. F. Framjee photo.*

The equipment used in the methylene blue test. 1—Milk samples. 2—Flask of prepared methylene blue solution. 3—Bottle of stock methylene blue solution. 4—Calibrated pipettes. 5—Test tubes upside down. 6—Rack with filled test tubes in place. 7—Methylene blue bath. 8—Thermometer.

Tough



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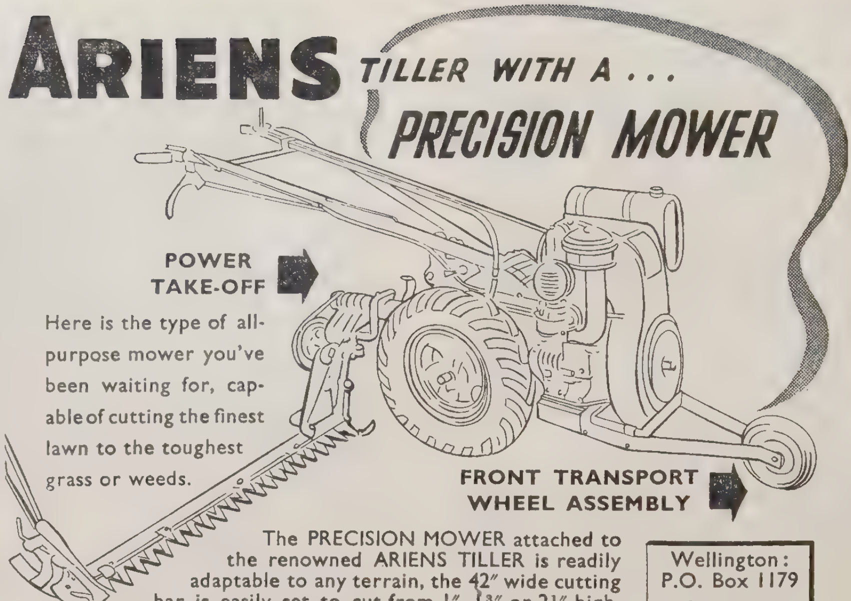

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The Culture of Meyer Lemon Trees

A CITRUS fruit which in recent years has gained much favour with the New Zealand home gardener and commercial citrus orchardist is the Meyer lemon. It is a sweet orange-lemon hybrid that comes into early fruiting and for its size bears a profuse crop of useful, attractive fruit. The Meyer is hardier than any of the standard lemon varieties, and it has proved especially valuable for cultivation in localities where the climate is slightly too severe for ordinary lemons. Being evergreen, it may serve a dual purpose by supplying the domestic grower with lemons and providing an excellent ornamental tree for the front lawn or garden. Though the flavour is distinctly different from that of the standard lemon, the Meyer is used and appreciated by many people as a substitute or alternative. The culture and harvesting of Meyer lemons are described in this article by F. L. Bailey, Orchard Instructor, Department of Agriculture, Tauranga.

[*Rendell's Photo Service photo.*

THE Meyer lemon was introduced into New Zealand some years ago from the United States of America. The variety was obtained by Frank N. Meyer, an agricultural explorer of the United States Department of Agriculture, at Fengtai, near Peking, China, and was taken to the United States in 1908. In China it was used as an ornament, grown from cuttings as a pot plant. It has been so commonly referred to in citrus districts of the United States as the Meyer lemon that this name has come to be generally recognised as its proper designation.

The fruit is smooth, thin skinned, of medium size, and less elongated in shape than the standard lemon. It is a deep, golden-yellow, has a beautiful texture, and is exceptionally juicy. The fruits are not as acid and highly flavoured as the standard lemons, but are acceptable to people who prefer a mild-flavoured fruit.

Until 1940 commercial planting in New Zealand was not extensive, but during recent years an increased demand for the fruit has led to a fairly-rapid expansion of planting in areas suitable for its culture. Expansion during the past 8 years no doubt would have been greater but for a shortage of trees.

Production of Meyer lemons on a commercial scale is at present confined to areas in the Kerikeri, Auckland, and Tauranga districts and, to a less extent, Gisborne. At the beginning of 1948 the distribution of Meyer lemon trees in registered orchards throughout the Dominion was as follows; the figures do not include trees in private gardens:—

Kerikeri	3,916
Auckland	1,991
Tauranga	2,178
Gisborne	405
Other North Island districts	537
South Island	319
Total	9,346

Most of the trees planted are comparatively young and, with the inclusion of plantings likely in the immediate future, there is every indication that commercial production will increase steadily during the next few years.

Selection of Site

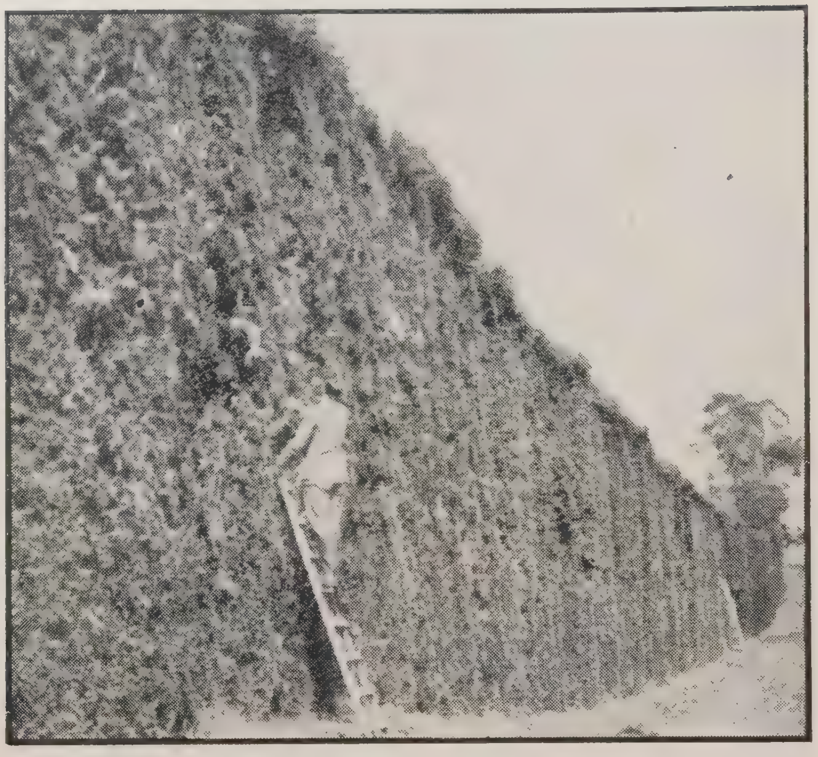
In common with other kinds of citrus, the Meyer lemon is subject to damage by frosts, so commercial planting is limited to the recognised citrus-producing areas in Auckland Province. Scope for expansion probably exists in certain selected areas of Hawke's Bay and Nelson Provinces, where citrus fruit is grown on a limited scale. In home gardens in various parts of the North Island, and in the north of the South Island, the variety can be grown where planting is confined to warm, favoured positions and young trees are protected adequately from frosts and cold winds.

For commercial production flat to gently-sloping land with a northerly or north-easterly aspect is most desirable for both warmth and ease of management. A good, friable soil overlying a subsoil that will not impede natural drainage is essential, for citrus trees generally are intolerant of waterlogged conditions. On the other hand, they tend to be shallow rooting, and a regular, well-distributed rainfall is necessary to ensure an adequate supply of moisture to the trees. In districts where prolonged dry spells occur during summer the provision of an ample water supply is wise so that irrigation may be resorted to if necessary.

[*Rendell's Photo Service photo.*

Portion of a healthy young Meyer lemon orchard.

CULTURE OF MEYER LEMONS



[*Rendell's Photo Service photo.*

A fine hedge of *Cupressus lawsoniana* in a Tauranga citrus orchard. It is kept at 20ft. high and trimmed to 1ft. 6in. wide.

Shelter

Shelter from cold and prevailing winds is necessary to ensure maximum growth and tree vigour. The Meyer lemon is an evergreen, and a hedge that will protect the trees adequately the whole year round is desirable. Deciduous hedges, such as those of Lombardy poplar which are used extensively in some orchard districts to shelter pip and stone fruit orchards, are not entirely satisfactory for citrus orchards when used alone. If the situation to be planted is unduly exposed to severe winds, necessitating the planting of high shelter for protection, tall-growing trees such as poplars, pines, or eucalypts may be used in conjunction with low-growing shelter to prevent ground draught. For that purpose bamboo (*Bambusa vulgaris*), *Tecoma carpensis*, and *Acmena floribunda* all provide useful shelter.

Permanent shelter belts should be established at least 2 years before young trees are set out. Except in unduly-exposed localities, excellent shelter 20 to 25ft. high can be provided by *Cupressus lawsoniana* or *C. benthami*, the latter variety being more suitable for the wetter types of soil. If these hedges are trimmed carefully and regularly in the early stages of development, a shelter that is fully furnished and dense to ground level will result. *Hakea saligna* is proving a satisfactory shelter in the North Auckland citrus areas; it grows rapidly and stands up to regular trimming. *Cupressus* species are popular as hedges with citrus growers in the Bay of Plenty district, and many fine breaks of *C. lawsoniana* may be seen in orchards around Tauranga.

Where the establishment of permanent shelter is not possible before the lemon trees are planted, temporary shelter can be provided in a very short period by growing *Albizzia lopantha* (brush wattle). The seed may be sown about October in the required position, and the hedge usually reaches a height of 10 to 12ft. within 2 years. It should be kept well trimmed to prevent excessive spreading. *Albizzia lopantha* is not a soil exploiter and, if anything, improves the texture and fertility of the soil.

Drainage

If natural drainage is insufficient to rid the soil of excess moisture, provision must be made for a drainage scheme capable of carrying away the water quickly when heavy rains fall. Many of the root and bark troubles associated with citrus trees are aggravated by poor drainage. No definite formula for drainage can be laid down, as each piece of land presents individual problems, but the aim should be to lay systematic and adequate drains which will carry away surplus water efficiently.

Meyer lemons should not be planted on land that is naturally wet or difficult to drain. Land with a high water-table is unsuitable for citrus culture, and successful results cannot be expected if trees are planted out in poorly-drained areas.

Stocks

Root stocks used in New Zealand for the progagation of citrus trees are the Island sweet orange seedlings, citronelle (rough lemon), and *Poncirus trifoliata* (deciduous dwarfing). The sour orange (Seville orange) is used occasionally but is not generally considered a satisfactory root stock for citrus trees in New Zealand.

Experience so far has indicated that Island sweet orange seedlings are the most satisfactory root stocks for all kinds of citrus trees intended for commercial planting. They can be recommended for Meyer lemons, as several healthy blocks of trees which have

[*Rendell's Photo Service photo.*

Hedges of *Albizzia lopantha*, 2 years old, planted as temporary windbreaks to protect a young citrus orchard.

[Rendell's Photo Service photo.

This Meyer lemon orchard was planted 9 years ago with trees 10ft. apart each way. It has since been necessary to remove alternate rows one way, leaving the planting distances 20ft. by 10ft. The trees in the rows are interlocked at the 10ft. spacing.

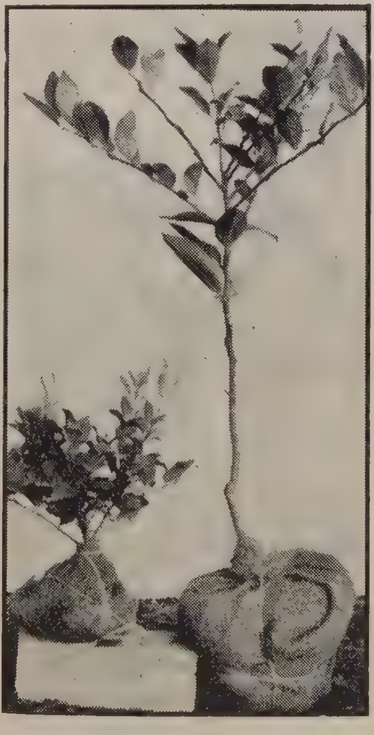
been worked on them are growing in the citrus-producing areas of the North Island. It is said to be more resistant to disease than citronelle stock, and is suitable for light, deep, and well-drained soils.

Citronelle stock may also be used, but it tends to produce a large proportion of coarse fruit in the early stages of tree development. Meyer lemons worked on this stock appear more susceptible to citrus verrucosis infection, and the fruit is not usually quite as fine in texture as that grown on the sweet orange stock. Citronelle stock is said to be more subject to bark diseases such as collar rot and bark blotch when planted in the heavier types of soil. As a root stock it cannot be recommended in preference to sweet orange except possibly where the soil is of a light, sandy type inclined to dry out. It is deep rooting and has a well-developed root system, which assists trees worked on it to thrive better under dry soil conditions.

Poncirus trifoliata is a very hardy, slow-growing stock which has a dwarfing effect on the scion. It thrives well on fairly-heavy, moist soils and is more resistant to cold conditions than other stocks used for citrus propagation. Meyer lemons grown on this stock are outstanding in both texture and appearance and contain possibly more juice for the size of fruit than those produced on other stocks. Because of its dwarfing effect, its use for commercial orchards is not recommended. Trees worked on this stock are small, and the yield per acre is usually lower than that from trees worked on the other stocks described. However, for domestic gardens, both in recognised citrus-growing areas and in colder parts of New Zealand where citrus can be grown, this stock is recommended where large trees are not desired. Citrus trees on *Poncirus trifoliata* stocks begin bearing fruit much earlier than those on other stocks.

Propagation

Advice about the propagation of Meyer lemon trees should be sought from the local Orchard Instructor of the Department of Agriculture by any grower desirous of raising his own trees.



[Rendell's Photo Service photo.

Left—A Meyer lemon cutting 2 years old. Right—A tree budded 18 months previously on sweet orange stock 8in. above the ground.

In recent years nurserymen in New Zealand have raised considerable numbers of Meyer lemon trees from cuttings. Though this method of propagation may have advantages in producing trees at a lower cost in a relatively-short time, it can hardly be regarded by commercial fruit growers as a satisfactory method of propagation for a long-term planting policy. It is doubtful if the rooting system of a cutting is as strong or as deep as that of seedling stock, and it does not appear to develop into the upright, vigorous type of tree that grows on the budded stock used normally.

Soil Preparation

The success of most horticultural undertakings depends on the care and thoroughness of the initial preparation of the land that is to receive the young plants, and Meyer lemon trees provide no exception.

If the land to be planted is in a virgin state, it should first be cleared and all rubbish that will not rot down when turned under burnt. If it is in pasture, the area should be skim ploughed in autumn and allowed to fallow during winter. In early spring the land should be cross-ploughed to a depth of about 6in. and carbonate of lime applied at the rate of 1 ton per acre, after which it should be disced. A crop of early potatoes planted at this stage will not only assist in breaking up the soil and suppressing weed growth, but will also provide a quick monetary return.

A leguminous cover crop, preferably blue lupins, should be sown early in the following autumn at the rate of 1½ bushels of seed per acre plus 3 to 4cwt. of superphosphate. That will assist the mechanical condition of the soil and improve aeration and fertility when the crop is turned under in late winter.

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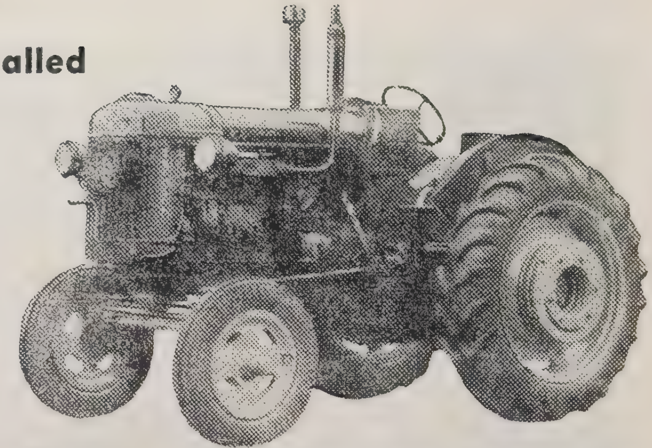

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A well-laden, mature Meyer lemon tree. The orchardist is more than 6ft. tall.

Planting

The young trees should not be planted out while there is a risk of frost damage. Usually August is preferred, and planting may continue into September. In some localities earlier planting may be possible, but the grower must be guided by the conditions in his area.

Meyer lemons do not grow into such large trees as do the standard lemon varieties and New Zealand grapefruit, so planting distances between the trees can be less than that usually recommended for other types of citrus. It is advisable to plant the trees on the square system to facilitate orchard management. Budded trees on sweet orange or citronelle stock should be set out in rows 18ft. apart, with 18ft. between trees; at these distances about 134 trees an acre will be required. Trees worked on *Poncirus trifoliata* stock may be planted closer —15ft. apart each way; that will require about 190 trees an acre.

Headlands of not less than 25ft. should be provided to allow easy manipulation of mechanical equipment. The turning of implements is restricted if trees are planted nearer to the orchard boundaries or shelter belts, and in later years the lemons in the outside rows are likely to suffer through competition with the shelter trees.

Methods of laying out an orchard are described in Bulletin No. 241, "Culture of the New Zealand Grapefruit, Orange, and the Mandarin," which may be obtained free from the nearest office of the Department of Agriculture.

When the orchard has been pegged the holes for the trees should be prepared. A mixture of fertiliser containing 2 parts of superphosphate and 1 of bonedust should then be applied to the bottom of each hole at the rate of about 1½ to 2lb. a hole and well worked into the soil.

Before each tree is planted the rooting system should be examined and any rootlets which are damaged or misshapen removed. In planting, the important point is to tread the soil firmly around the roots so that the young trees have a firm anchorage. The top 2in. of soil should be placed loosely around the tree, which should be planted at the same depth as it was growing in the nursery row; the soil mark on the stock will indicate this.

Pruning

Some growers wrongly believe that pruning of Meyer lemons is unnecessary. That belief is probably attributable to the fact that Meyer lemon trees, especially in their earlier years, grow fruit satisfactorily without being pruned.

As a long-term policy pruning is just as essential for citrus trees as for deciduous trees and, though the treatment is not as drastic, nevertheless it is important that pruning be systematic and regular. The early decline of citrus trees through bark diseases and citrus borer infection very often may be traced back to neglect and inadequate pruning treatment.

For the first 2 or 3 years after being planted the trees should be encouraged to produce vigorous growth, and at the same time a strong framework should be built up. In a well-shaped tree the fork (where the main limbs branch) should be at least 12in. above the ground; all shoots which develop below the fork should be rubbed off periodically.

In its habit of growth the Meyer lemon tree is more akin to the sweet orange than to the standard varieties of lemons, which are more open headed. Therefore, Meyer lemons are pruned more lightly than the standard lemons. When the foundation of the young tree is being built 3 to 5 main branches that will develop into a shapely, balanced head should be chosen for the main arms. If necessary, these should be shortened back to preserve the shape, to promote strength in the weaker growth, and to induce lateral growth. All central growth should be thinned out and any young branches which cross should be removed. Young trees should be inspected regularly throughout the year and all unwanted growth suppressed.

If trees are trained early and correctly, they will develop into sturdy, well-shaped specimens requiring relatively-little hard cutting in later years.

When the trees are in regular bearing pruning consists mainly of thinning out crossing laterals and shortening straggling growths to preserve the symmetry of the trees. All dead, diseased, and broken twigs should be cut out first, after which the lateral growth may be thinned to prevent overcrowding and admit light and air. Dense trees invariably produce poor-quality fruit, they are usually more subject to infection by insect pests and diseases because of the protection afforded them, and spray penetration is restricted. Where the removal of limbs more than 1in. in diameter is necessary the wounds should be painted over carefully with a wound-dressing compound. That is important, as citrus borer often gains entry through wounds which have been carelessly pruned and treated.

As most of the fruit from Meyer lemon trees is harvested during winter and early spring, pruning is best undertaken in late spring. By then the danger of late frosts is usually over, and the new growth has ample time in which to mature before the following winter. Light pruning or the removal of dead and diseased wood may be done at any time. All prunings should be gathered up and burnt as soon as the work is completed, and not left piled up in some odd corner.

Cultivation

Meyer lemon trees, in common with all types of citrus, are shallow rooting, and deep cultivation will destroy valuable fibrous roots. Therefore, though cultivation may be fairly deep in the middles of rows, implements should be set shallower when working near the trees. The use of mechanical equipment is not advisable closer to the trees than the spread of the branches; any further cultivation should be done by hand hoeing and should not be more than a few inches deep.

In orchards where clean cultivation is practised frequent shallow cultivation in spring and summer is all that is necessary to conserve soil moisture and control weeds.

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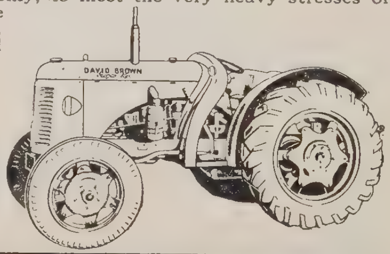

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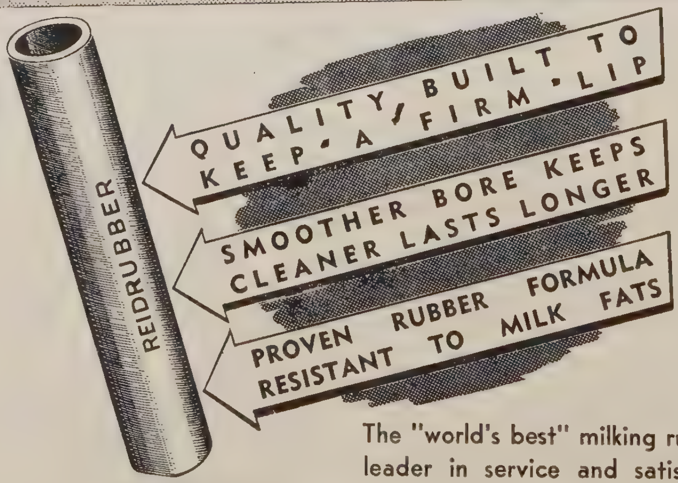
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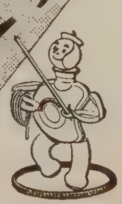

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On the lighter soils in parts of the north Auckland district and in the Bay of Plenty grassing of citrus orchards has been adopted by many growers and has much to commend it. Conditions for orchard work are much cleaner, and in some localities, particularly on sloping land, loss of valuable topsoil through wind and water erosion has been prevented. Orchards which are grassed require mowing at intervals, and the grass cuttings should be gathered up and used for mulching around the trees. Regular mowing is essential to reduce moisture transpiration in dry weather.

Mulching and Green Manuring

Of undoubted value is an area of land near by in which a crop such as lucerne may be grown to enhance the mulch produced in the orchard. A grass mulch conserves soil moisture, and even in the hottest weather mulch-covered soil in the cultivated squares beneath the trees remains quite moist. The following pasture mixture has been sown in a number of Meyer lemon and other citrus orchards in the Tauranga district:—

	lb. per acre
Prairie grass	40
Cocksfoot	7
Broad red clover	5
White clover	1½
Total	53½

This mixture has provided a good sward and has produced a satisfactory yield of material valuable for mulching.

In addition to the use of grass as a mulch, any well-rotted organic materials such as stack bottoms and farmyard or poultry manure are beneficial in promoting vigorous growth and may be applied to the trees liberally. In cleanly-cultivated orchards a green crop should be sown each year to enrich the organic content of the soil. For this purpose legumes probably are most suitable because of their high nitrogen content. One of the legume family, which includes blue lupins, vetches, and field peas, should be sown in early autumn at the rate of 1½ bushels of seed per acre plus 3cwt. of superphosphate.

Fertilisers

Though mulching and growing cover crops do much to enrich the soil, most growers find supplies of organic material alone insufficient for the full requirements of the tree. To overcome that deficiency artificial fertilisers are necessary to ensure adequate plant nutrition.

Nitrogen is one of the main limiting factors in citrus fruit production, and it is likely to be in short supply during early spring, when it is most required by the trees. Cover crops eventually add nitrogen to the soil, but it may be temporarily unavailable, so quick-acting nitrogenous fertiliser must be added in spring.

Sulphate of ammonia may be applied a month before growth begins or as growth starts nitrate of soda may be applied to provide the required nitrogen supply at that period. Slower-acting nitrogenous fertilisers combined with phosphorus may be applied in the form of blood and bone, which is used extensively in the citrus-growing areas with good results. Potash is best applied in the form of sulphate of potash.

The application of the quick-acting nitrogenous fertiliser, together with potash and about half the blood and bone manure, is advisable during early August. The remainder of the blood and bone may be applied during the following February.

The quantity of manure applied each year varies with the soil type, the age of the trees, and quantity of fruit they produce. About 1lb. of mixed manures should be applied for each year of the tree's age from the time of planting, up to a maximum dressing of 10 to 15lb. per tree for mature trees.

The following quantities and times of application are suggested for 8-year-old trees: **Early August:** 2lb. of sulphate of ammonia, 2½lb. of blood and bone, and 1lb. of sulphate of potash or muriate of potash at an equivalent rate. **February:** 2½lb. of blood and bone. The quantities should be increased or decreased according to the age and vigour of the trees.

[Rendell's Photo Service photo.

In the harvesting of the fruit the stalk is first cut back to a mature bud, then removed flush with the button.

If cover crops are grown, the seed should be sown with 3cwt. of superphosphate per acre in addition to the suggested manurial programme. For orchards which are grassed an autumn broadcast dressing of 3cwt. of superphosphate is also recommended. To correct soil acidity and maintain the soil in good friable condition, carbonate of lime should be broadcast in most orchards at the rate of 10cwt. per year at the same time as the cover crop is sown or during early winter.

With young trees the manure should be spread evenly from 1ft. from the trunk of the tree to just outside the spread of the branches. With mature trees the fertiliser should be spread evenly over the whole area in cleanly-cultivated orchards, or over the cultivated square or circle in orchards which are in permanent pasture. All fertilisers should be lightly worked or hoed into the soil after application.

Harvesting

Unlike the standard varieties of lemons, which bear a summer and a winter crop, the Meyer lemon tree bears one main crop, which usually reaches maturity toward the end of May or the beginning of June. The peak of harvesting is reached shortly before the heavy harvesting period of the winter crop of standard lemons. During summer and autumn crop production is almost negligible, and only a very small proportion of the crop is marketed after winter and early spring.

Picking should be started when the fruit is almost fully coloured, several pickings being necessary during the peak period. For their size the trees carry heavy crops, so to enable most of the crop to size, the larger fruits should be picked first to relieve the weight on the trees. Intelligent picking in that respect will allow the smaller lemons to size up, resulting in a higher yield of better-quality fruit.

The fruit should never be pulled from the tree, but should be cut with a pair of lemon clippers or secateurs. Two cuts are always necessary to remove the fruit. In the first cut the stalk is cut back to a mature bud, and the stalk is removed by making the second cut flush with the button. Many of the stubby, dead twigs and much of the weak growth apparent in some trees are obviated when the first cut is made back to healthy fruiting wood.

The importance of careful handling of the fruit cannot be too strongly stressed. Skin injury caused by protruding nails in picking cases, over-filling of cases, and unnecessary dumping of the fruit all cause damage. Mould spores enter the fruit through the injured rind and set up wastage by green and blue mould infection, a condition which is only too familiar to many growers of citrus fruits. If the lemons are handled as carefully as eggs, little wastage will result.

Grading

Under the terms of the New Zealand Grown Fruit Regulations, 1940, several grading standards are prescribed for lemons. The standards providing for peel and juice grades do not apply to the Meyer lemon. Four grading standards, "extra fancy," "fancy," "commercial," and "minimum," are applicable in the preparation of Meyer lemons for market, but in general, growers will find that most of the fruit will come within the standards of the first 2 or 3 grades. The following table summarises the main concessions in grading the fruit:—

MAXIMUM ALLOWANCES

Grade	Hail mark (slight) diameter	Blemish (slight) per cent.	Russet (smooth) per cent.	Brownish discoloration (slight) per cent.	Aggregate area on any one fruit per cent.
Extra fancy .. .	—	5	—	—	—
Fancy . ..	—	10	—	—	—
Commercial	½in.	20	40	10	50
Minimum	¾in.	30	50	10	60

Packing Meyer Lemons

Four standard packages may be used in which to pack Meyer lemons. They are:—

Case No.		Inside Measurements (in.)
No. 2	..	.. 8½ x 11½ x 18
No. 6	..	.. 7 x 7 x 18
No. 7	..	.. 6 x 9 x 11
No. 9	..	.. 4½ x 7 x 18

The cases most favoured are Nos. 2 and 6, the other two being seldom used. Cases Nos. 2 and 6 are commonly referred to as the ¾ and ½ bushel, and they appear quite suitable to the trade. The following lists will assist growers to pack fruit in these cases in a uniform manner:—

STANDARD PACKAGE No. 2.

Packed the Wide Way

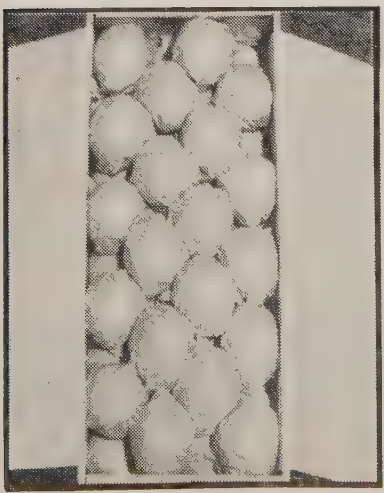
Style of pack (crosswise)	No. in rows (lengthwise)	No. of layers (depth)	Count	Approximate size (in.)
3-2	5-5	4	100	2¾
3-2	6-5	4	110	2⅝
3-2	6-6	4	120	2½*
3-3	4-4	5	120	2½
3-3	5-4	5	135	2⅜†
3-3	5-5	5	150	2⅜
3-3	6-5	5	165	2⅜
3-3	6-6	5	180	2¼†
3-3	6-7	5	195	2¼
3-3	7-7	5	210	2⅛
4-3	6-5	6	231	2
4-3	6-6	6	252	1⅞†
4-3	7-6	6	273	1⅞
4-3	7-7	6	294	1¾

* Tight pack. † Variation up.

STANDARD PACKAGE No. 6.

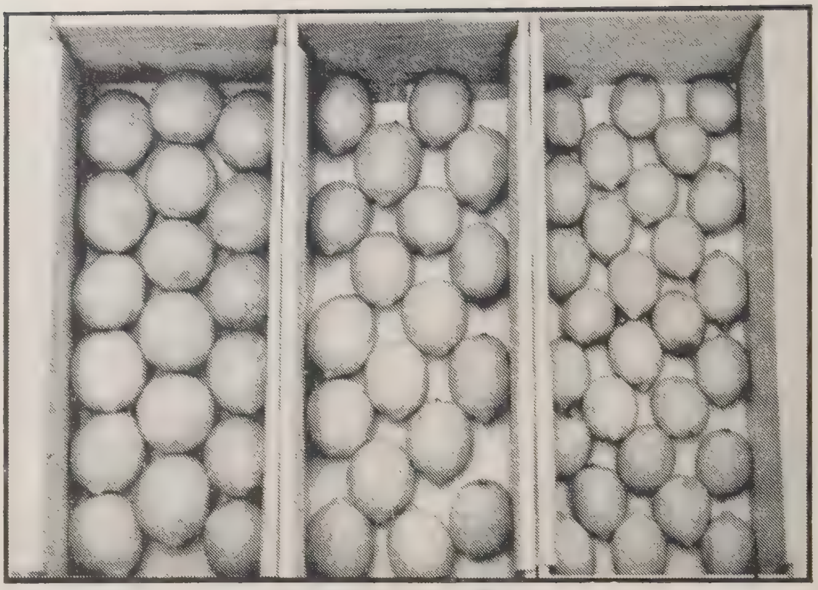
Style of pack (crosswise)	No. in rows (lengthwise)	No. of layers (depth)	Count	Approximate size (in.)
2-1	4-4	4	48	2⅝†
2-2	4-4	4	64	2½
2-2	5-4	4	72	2 7/16
2-2	5-5	4	80	2⅜
3-2	5-4	4	90	2¼*
2-2	6-5	5	110	2⅛
3-2	5-5	5	125	2
3-2	6-6	5	150	1⅞

† Very loose pack. * Very tight pack.



[*Rendell's Photo Service photo.*

A well-packed case of Meyer lemons.



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Left—The 2-1 pack. Centre—The 2-2 pack. Right—The 3-2 pack.

The diagonal pocket-pack system should be used—that is, one so designed that the fruits in one layer are placed in the spaces between the fruits in the layer beneath.

For a uniform pack fruit requires to be evenly sized, and the bottom layer of fruit must be carefully and systematically placed in the case. The lemons should be packed on the cheek, with the nipples of the fruit facing the one way. The fruits at each end of the case should be packed with the nipple pointing in to avoid damaging that protruding portion.

The lists show that there are 3 styles of pack for the No. 6 case—2-1, 2-2, and 3-2.

2-1 Pack: This term means that a start is made from one end of the case and a fruit is placed in each corner across the case; a single fruit is then placed partly between the two fruits, then 2, then 1, continued alternately until the layer is completed.

2-2 Pack: A start is made from one end of the case; one fruit is placed in the corner and another half-way across. In the second row the first fruit is placed between the 2 in the first row, and the second between the second fruit in the first row and the side of the case. The rows are continued alternately until the layer is completed.

3-2 Pack: Start at one end of the case; 3 fruits are placed across, 1 in each corner and 1 between. In the next row the first fruit is placed between the first and second of the first row, and the second fruit between the second and third of the first row. Rows are continued alternately until the layer is completed.

According to the size of fruit and style of pack the same methods are adopted to pack the No. 2 case. Whatever the style of pack, the fruits in the second and subsequent layers are placed in the pockets formed by the layer beneath. Four or 5 layers are required to fill each case, according to the size of the fruit.

Wrapping the bottom layer is recommended to hold the lemons in position and protect the fruit from the roughness of the bare timber. Some growers use a case liner of plain or corrugated cardboard and also wrap the top and bottom layers of fruit in each package. Fruit packed in this manner invariably withstands transport better, and when opened up on the auction floor presents an attractive and finished appearance, creating a favourable impression on buyers.

In accordance with the New Zealand Grown Fruit Regulations, 1940, each package should be neatly branded on one end with the following particulars by means of stencils or rubber stamps, the particulars must be in decipherable characters of not less than ⅜in. block type: On the bottom left-hand corner, the registered mark of the owner of the fruit; on the bottom right-hand corner, the variety of fruit, grade, and count marks. The railing or shipping mark may be stamped or stencilled on the centre of the same end of the package.

Diseases

The Meyer lemon is subject to the diseases and insect pests which are common to all other citrus fruits. Growers are advised to consult local Orchard Instructors of the Department of Agriculture for information on this aspect.

References

"The Citrus Industry," Volume 1, Webber and Batchelor, pages 603 and 604.

Bulletin No. 96, New Zealand Department of Agriculture, "Lemon Culture in New Zealand," W. K. Dallas.

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ROLES OF HAY AND SILAGE IN PASTURE MANAGEMENT

SEASONAL NOTES Contributed by the EXTENSION DIVISION

HAYMAKING and silage making, both necessary adjuncts to grassland farming on New Zealand dairy farms, unfortunately have adverse effects on even the best pastures, but good field husbandry can to some extent lessen these ill effects.

IN most dairying districts of the North Island the critical month for feed supplies is September. Winter-saved pasture has then been utilised, supplies of hay and silage are practically finished on most farms, and the rate of growth of the pastures is below requirements. This causes any available grass to be utilised as soon as it is long enough for the cows to graze, and the close grazing often retards the recovery of the pasture until well into the following month of October. If larger fodder conserves had been available, fields could have been closed toward the end of September or early October, and when this is the case the first flush of grass, instead of being eaten, is soon long enough to harvest as silage. By retaining all the leaf growth, heavier and earlier crops are available with a higher nutritive and digestibility value.

When silage is cut early and in the leafy to early flower stage the growing season, although well advanced, is by no means over, and the recovery of these fields provides excellent succulent fodder when that on the balance of the farm is becoming less palatable; but to ensure early harvesting only those fields showing a predominance of ryegrass and white clover should be closed. Closing a field lacking in these two species generally results in a light, late crop from which overheated or burnt silage is often made.

The feed situation and the need to harvest the crop during fine weather usually preclude closing hay paddocks at the same time as those to be harvested for silage, but later closing does not detract from the value of the hay harvested, provided it is cut in the flower stage and not allowed to develop seed. If hay is cut after the seed has developed, the growing period of the plants is past, and during February and early March the paddock is dormant, providing no feed whatever, while earlier cutting results in a dense aftermath that maintains production during the dormant period in late summer and can obviate the necessity of growing supplementary summer crops.

Only fields showing vigorous white clover should be closed for hay.

Hay and silage should be fed out on the fields from which they are harvested.

As the harvesting of fields for hay or silage, particularly for hay, tends to suppress the white clover, this plant should be particularly vigorous in those paddocks selected for harvesting, and to obviate its ultimate extinction harvesting fields should be rotated around the farm and cut only once in 3 or more years for hay; for silage they may be cut more often. The practice of cutting the same field year after year cannot be recommended, as this tends to strengthen the coarser grasses and eliminate both the clovers and the ryegrass.

The sward deterioration resulting from harvesting can be repaired to some extent by feeding out the harvested material on to the area from which it came and by topdressing as soon as the crop is removed to increase the aftermath, the eating of which in situ results in a considerable return of stock nitrogen to the field. For this reason the use of night paddocks near the cowshed is condemned, as it results in a transference of fertility from the harvested fields, while the practice of cutting hay for sale, usually late to obtain a heavy crop, also depletes the fertility and retards the growth of the aftermath, the grazing of which would recompense the paddock slightly.

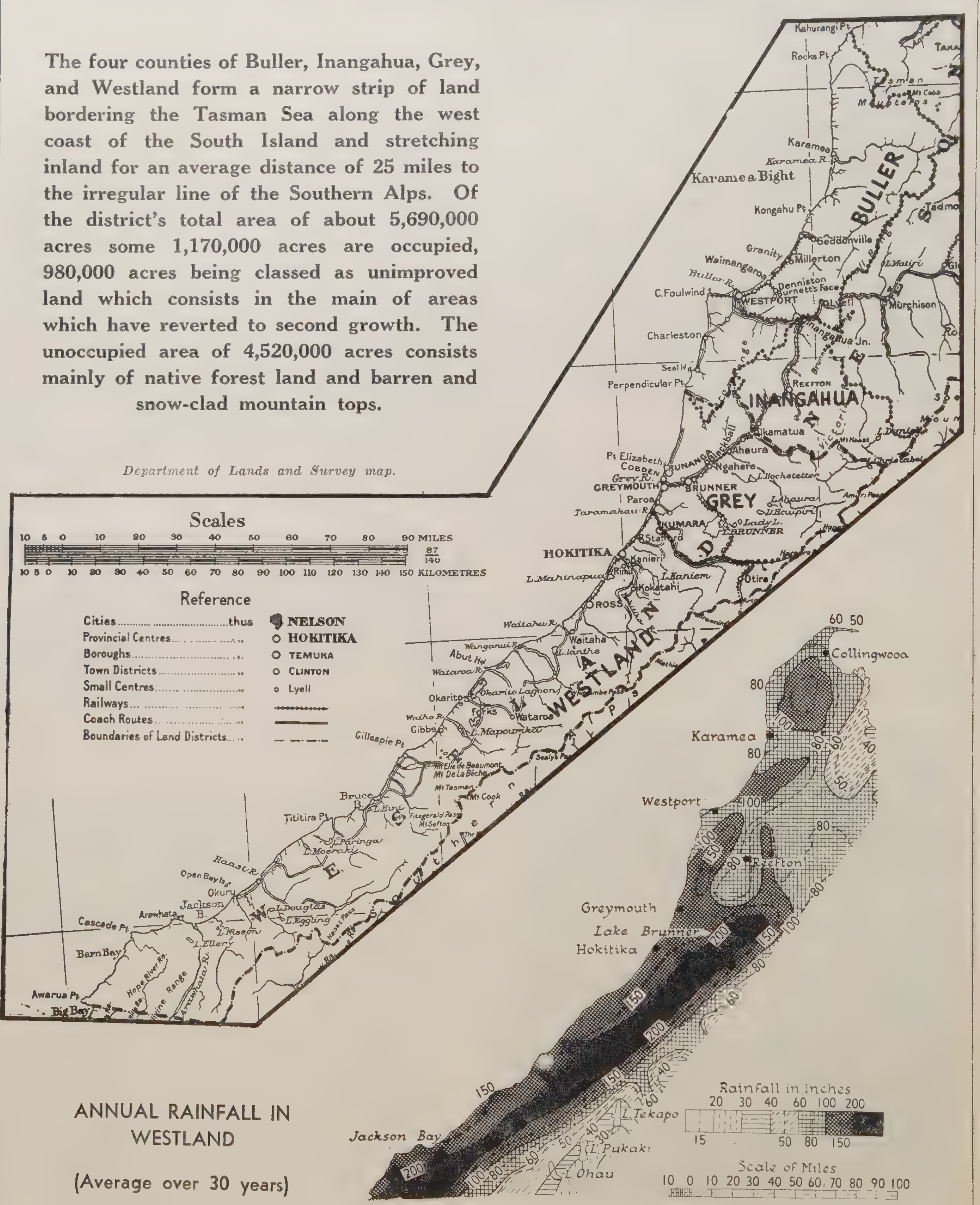
To prevent sward deterioration and at the same time obtain reasonable crops of hay or silage the following recommendations should be observed:—

1. Close early.
2. Cut early, in leaf stage for silage and flower stage for hay.
3. Rotate harvesting fields; never harvest the same field year after year.
4. Feed out on the harvested area.
5. Topdress as soon as the crop is removed.
6. Graze harvested fields both day and night.
7. Select only those fields strong in white clover.
8. Don't make hay for sale.
9. Protect stacks adequately so that all harvested material is available for controlled utilisation.

THE TOPOGRAPHY OF WESTLAND

The four counties of Buller, Inangahua, Grey, and Westland form a narrow strip of land bordering the Tasman Sea along the west coast of the South Island and stretching inland for an average distance of 25 miles to the irregular line of the Southern Alps. Of the district's total area of about 5,690,000 acres some 1,170,000 acres are occupied, 980,000 acres being classed as unimproved land which consists in the main of areas which have reverted to second growth. The unoccupied area of 4,520,000 acres consists mainly of native forest land and barren and snow-clad mountain tops.

Department of Lands and Survey map.


Scales
10 5 0 10 20 30 40 50 60 70 80 90 MILES
87/140
10 5 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 KILOMETRES
Reference
Cities thus NELSON
Provincial Centres HOKITIKA
Boroughs TEMUKA
Town Districts CLINTON
Small Centres Lyell
Railways
Coach Routes
Boundaries of Land Districts
BULLER
INANGAHUA
GREY
WESTLAND
Kahurangi Pt
Rocks Pt
Karamea
Karamea R.
Karamea Bight
Kongahu Pt
Seddonville
Granity
Millerton
Waimangaroa
Buller R.
Denniston
Burnett's Face
C. Foulwind
WESTPORT
Lyell
Murchison
Charleston
Inangahua Jn.
REEFTON
Perpendicular Pt
Ikamatua
Pt Elizabeth
RUNANGA
COBDEN
Grey R.
GREYMOUTH
BRUNNER
Ahaura
Ngahere
Paroa
Taramakau R.
KUMARA
Stafford
L. Brunner
HOKITIKA
Kaniere
Rimu
L. Mahinapua
L. Kaniere
Kokatahi
Otira
ROSS
Waitaha R.
Waitaha
L. Ianthe
Wanganui R.
Abut Hd
Wataroa R.
Okarito
Okarito Lagoon
Forks
Wataroa
Waiho R.
Gibbs
L. Mapourika
Gillespie Pt
Mt Elie de Beaumont
Mt De La Beche
Mt Tasman
Mt Cook
Bruce B.
L. Mini
Fitzgerald Pass
Mt Sefton
Tititira Pt
L. Paringa
L. Moeraki
Haast R.
Open Bay Is.
Okuru
Jackson B.
Arawhata
Cascade Pt
L. Douglas
L. Eggling
L. Mason
L. Ellery
Haast Pass
Barn Bay
Hope River Ra.
Arawhata R.
Awarua Pt
Big Bay
Southern Alps
Collingwood
Karamea
Westport
Reefton
Greymouth
Lake Brunner
Hokitika
Jackson Bay
L. Tekapo
L. Pukaki
L. Ohau
Rainfall in Inches
20 30 40 60 100 200
15 50 80 150
Scale of Miles
10 0 10 20 30 40 50 60 70 80 90 100

ANNUAL RAINFALL IN WESTLAND

(Average over 30 years)

Drawn by the Head Office, Department of Lands and Survey, from a map produced by C. J. Seelye.

FARMING IN NEW ZEALAND

Westland

SINCE the first days of settlement Westland has been economically dependent on the wasting assets of gold, coal, and timber. Despite the fact that its farming has developed with many ups and downs, its record of achievement is commendable, and at present signs are offering of a definite interest in furthering the district's agricultural possibilities. There are areas capable of considerable improvement under existing economic conditions, and greater areas capable of development but which perhaps would be better left until a later stage in the Dominion's development. J. R. Shepherd, Fields Instructor, Department of Agriculture, Greymouth, reviews the production and potentialities of the district in this article, which covers the counties of Buller, Inangahua, Grey, and Westland.

THE discovery of gold in 1864 stimulated interest in the Westland district and crowds of gold seekers flocked there. Typical gold-mining towns soon sprang up and the first steps in opening up the district had been taken. The country was far from inviting to these intrepid people, being covered with dense bush from the shores of the Tasman Sea to very near the snow line of the Southern Alps, but gold seekers were not a type to be daunted by Nature's obstacles, and settlement of the district was practically assured. Internal transport presented considerable difficulties to them—nearly-impenetrable forest and swift-flowing creeks and rivers subject to rapid flooding were some of the hindrances to be overcome. As the winning of gold was their only consideration, they took no interest in any aspect of the land but its prospective mineral value. Meat, mainly beef, was brought from Taranaki by cattle boat, and other foodstuffs were imported from the outside world.

The richer gold deposits were soon worked out, and attention was then diverted to the coal and timber resources, which had the effect of hastening the opening up of the country for men with an inclination for farming. As soon as an area was milled out by the standards of those days the land was taken up and the land owners, in an endeavour to become established quickly, applied the fire-stick to their holdings, the resultant burn being sown to grass on the ash, usually with good results. These areas were soon stocked to peak carrying capacity, stock, particularly sheep, being brought in from Canterbury. As the timber cutters moved further inland and afield roads were formed and rivers and streams bridged.

Topography

The Westland district is a narrow strip of land bordering the Tasman Sea along the west coast of the South Island and stretching inland for an average distance of 25 miles to the irregular line of the Southern Alps. It is a rugged region of three levels—steep mountain ranges, the terraces and lower ranges, and a narrow coastal plain of varying width; the middle level and the coastal flats are dissected by valleys drained by fast-flowing creeks and rivers following more or less well-defined courses to the seaboard.

These watercourses, fed by snow and rain, are liable to rapid flooding after heavy rain in the catchment areas. That, coupled with the steep grade of the beds from headwaters to mouths, is responsible for the great amount of material carried down to be deposited in the riverbeds at lower levels and the outlets to the sea. With the building up of the riverbeds come the changing of channels and riverbank erosion.

Climate

The climate may be termed "wet temperate"—that is, both rainfall and humidity are high. The precipitation is fairly evenly distributed over the year, the heaviest being in the four months from October and January. The following table shows mean annual rainfall of certain west coast stations:—

Station	Mean annual rainfall (in.)
Karamea	73.76
Westport	77.69
Greymouth	101.71
Hokitika	114.64
Ross	134.41
Harihari	135.47
Wataroa	196.26
Inchbonnie	189.60

The mean annual rainfall increases from north to south; Karamea, the most northerly recording station in the district, has 73.76in. and Wataroa in the southern section has 196.26in. Similarly, there is a variation between the coastal belt and the mountain ranges; Greymouth, on the coast, has 101.71in. and Inchbonnie, further inland, has 189.6in.

Temperatures are mild to warm, offsetting to some extent the high rainfall. Frosts are severe only in the inland valleys, and though falls are heavy in the alps and lower ranges, snow seldom falls near the coast. The temperature range from season to season is relatively small, as is indicated by the following figures:—

MEAN DAILY TEMPERATURE
(degrees F.)

	Westport	Hokitika
January	59.5	59.7
February	59.6	59.8
March	57.7	57.7
April	54.7	54.3
May	50.2	49.2
June	46.9	45.6
July	45.8	44.7
August	46.5	46.0
September	49.3	49.2
October	52.0	52.1
November	54.2	54.4
December	57.5	57.7
Year	52.8	52.5

Sunshine figures are much higher than might be expected, indicating that a great part of the rain is in falls of high intensity and falls at night. The following table shows monthly hours of sunshine at two Westland recording stations, Westport and Hokitika, and at Christchurch, a Canterbury recording station:—

HOURS OF SUNSHINE

	Westport	Hokitika	Christ-church
January ..	216.7	206.0	209.0
February ..	161.6	176.1	187.3
March	181.3	177.6	176.6
April	148.2	134.8	136.3
May	133.8	130.6	130.6
June	116.1	112.0	108.8
July	137.7	133.4	121.7
August	142.2	143.6	140.4
September ..	149.5	148.4	160.2
October ..	174.1	160.6	188.8
November ..	177.9	173.4	208.8
December ..	213.9	198.6	199.0

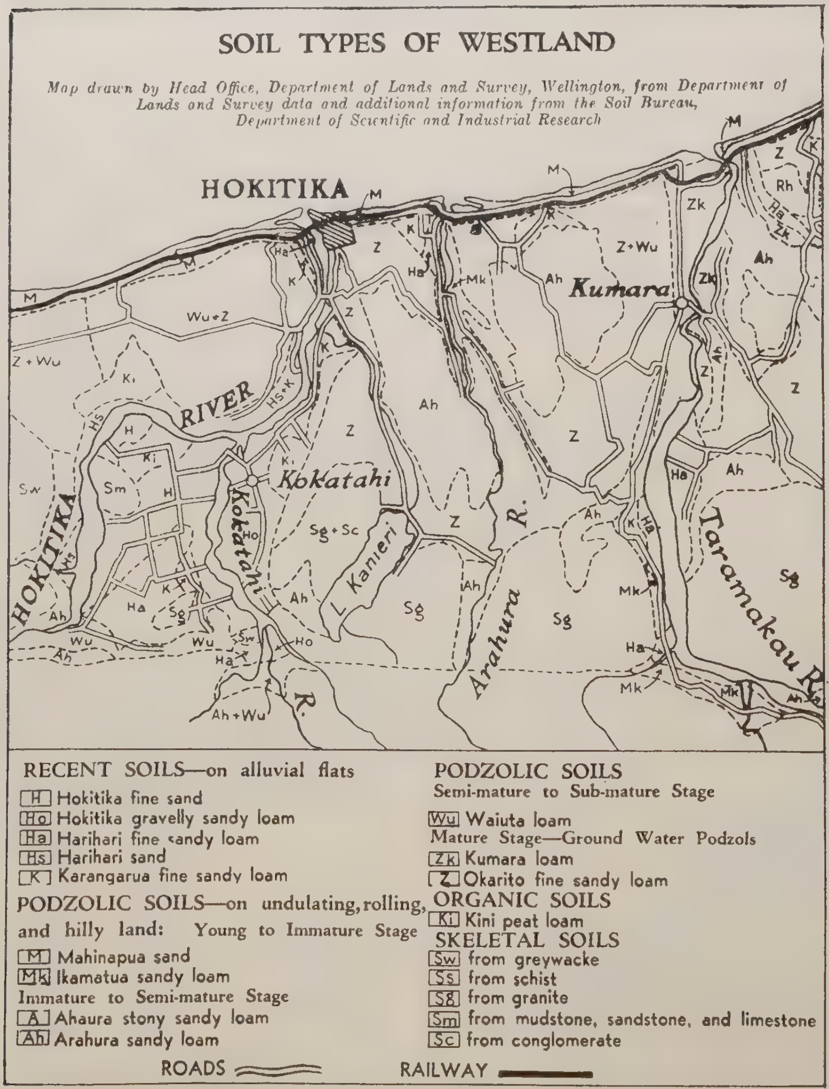
Because of the comparatively-mild temperatures there is even some pasture growth in winter, especially where the land has been topdressed. Growth increases gradually during spring, and there is not the sudden growth at this period which occurs in some other districts and is responsible for stock losses and ailments.

Transport and Markets

Present transport services are reasonably good, but in some areas access can still be improved. The railway serves only a limited area of the district; all areas south of Ross or north of Seddonville, and the inland valleys, have no near rail facilities and are served by road transport services operating over hilly and narrow routes.

The Otira tunnel, giving a rail link with Canterbury, has been of considerable benefit to the development of Westland, enabling considerable numbers of beef cattle to be sold at the Addington market and fat lambs to be taken to freezing works in Canterbury.

Internal highways give access to Nelson and Marlborough via Murchison and to Canterbury via the Lewis Pass and Otira Gorge routes. A daily passenger and mail air service to Nelson connects with the inter-island airlines.



SOIL TYPES OF WESTLAND

Map drawn by Head Office, Department of Lands and Survey, Wellington, from Department of Lands and Survey data and additional information from the Soil Bureau, Department of Scientific and Industrial Research

HOKITIKA
Kumara
Kokatahi
RIVER
HOKITIKA
Kokatahi R.
L. Kaniere
Arahura R.
Taramakau R.
M
Mk
Z
Z+Wu
Wu+Z
Zk
Rh
Ah
Ah+Wu
Ha
Hs
Ho
H
K
Ki
Sg
Sg+Sc
Sm
Sw
Wu
RECENT SOILS—on alluvial flats
H Hokitika fine sand
Ho Hokitika gravelly sandy loam
Ha Harihari fine sandy loam
Hs Harihari sand
K Karangarua fine sandy loam
PODZOLIC SOILS—on undulating, rolling, and hilly land: Young to Immature Stage
M Mahinapua sand
Mk Ikamatua sandy loam
Immature to Semi-mature Stage
A Ahaura stony sandy loam
Ah Arahura sandy loam
PODZOLIC SOILS
Semi-mature to Sub-mature Stage
Wu Waiuta loam
Mature Stage—Ground Water Podzols
Zk Kumara loam
Z Okarito fine sandy loam
ORGANIC SOILS
Ki Kini peat loam
SKELETAL SOILS
Sw from greywacke
Ss from schist
Sg from granite
Sm from mudstone, sandstone, and limestone
Sc from conglomerate
ROADS
RAILWAY

Port facilities are limited to the bar harbours of Greymouth and Westport, which handle mainly coal and timber.

Soils

The area at present farmed in Westland is mainly in the river valleys and on the lower terraces and to a limited extent on the coastal belt. The lands of Westland may be broadly divided into five classes, with variations within these classes, as follows:—

The coastal belt.

The river flats—(a) shallow free-draining soils; (b) deep free-draining soils; (c) poorly-draining soils.

River terraces—(a) low-level terraces; (b) high-level terraces.

Pakihi lands.

Lower ranges.

The Coastal Belt

A narrow belt of sand-dune country occurs intermittently along the sea coast. The soil type varies from unconsolidated sand to consolidated sand underlying a sandy loam topsoil (Mahinapua sand). The consolidated sand carries a light vegetative cover of lupins, marram grass, and some gorse and is lacking in humus; the consolidated sand, through time and the establishment of light to medium forest species, has built up an appreciable humus content and produces good pasture when cleared and dressed with lime and phosphate.

The soils of this class are generally free draining, the exceptions being the depressions, the draining of which is limited by a peaty sand topsoil and their height above sea level. This class of land is used mainly for dairy farming.

The River Flats

The areas within the valleys on the lower levels bordering the watercourses form the river flats. These valleys fall into two categories: The open flood-plain type widening from the catchment area to the coast (for example, the Arahura Valley), and those where the coastal range terminates the flood plain, leaving the river a narrow channel through which to discharge into the sea (for example, the Grey River Valley). The soils in this class have been built up from flood deposits (much land in close proximity to the rivers still being subject to flooding) brought down from the catchment areas, where the parent rock consists in varying proportions of granite, greywacke, and schist. The mica schist soils are generally conceded to be the richest in plant nutrients. The types within this class are:—

Shallow free-draining soils (Hokitika gravelly sandy loam): This type consists of a shallow layer of fine or coarse sandy topsoil overlying stony gravels containing some sand. Drainage is good throughout this series, the soil never remaining wet even after heavy and continuous falls of rain—in fact, more frequently they dry out quickly and can withstand only short periods of dry weather without drought conditions occurring. Considerable leaching has given rise to deficiencies in calcium and phosphate, but where these have been applied

Under the soils of the pakihi lands is an impervious pan which effectively bars drainage, and the land overlying it is almost continuously waterlogged.

in sufficient quantity good pastures can be established. This factor, coupled with good drainage and freedom from poaching and flooding during wet weather, makes this class of land eminently suitable for dairying (the major purpose for which it is used) and sheep farming. Some of Westland's most productive farms are on soils of this type, which are well represented in the Upper Kokatahi, Harihari, Poerua, and Wataroa districts.

Deep free-draining soils (Hokitika fine sandy loam): This type consists of 9 to 12in. of fine sandy loam overlying grey sand. Soils adjacent to present river courses are subject to occasional flooding and consequently are more fertile than those above flood level. The older soils of this type are not as free draining as the more recent ones because of the greater progress of leaching, but potentially they are as fertile and productive as the shallow free-draining soils, though the requirement of lime and phosphate is greater. Large areas have been developed mainly for dairying, and are widely distributed throughout the district from Wataroa to Westport.

Poorly-drained soils (Karangarua fine sandy loam and Harihari fine sandy loam): These soils occupy flat low-lying land, generally some distance from the riverbanks. The topsoil is shallow, averaging 2½ to 3in., and the vegetative cover is kahikatea and flax, an indication of their wetness. These soils potentially are as fertile as the first type, but their development is hindered by difficulties of drainage caused by lack of suitable fall. Into this class also fall the soils of the widely-distributed peat bogs (Kini peaty loam).

Terraces and Low Foothills

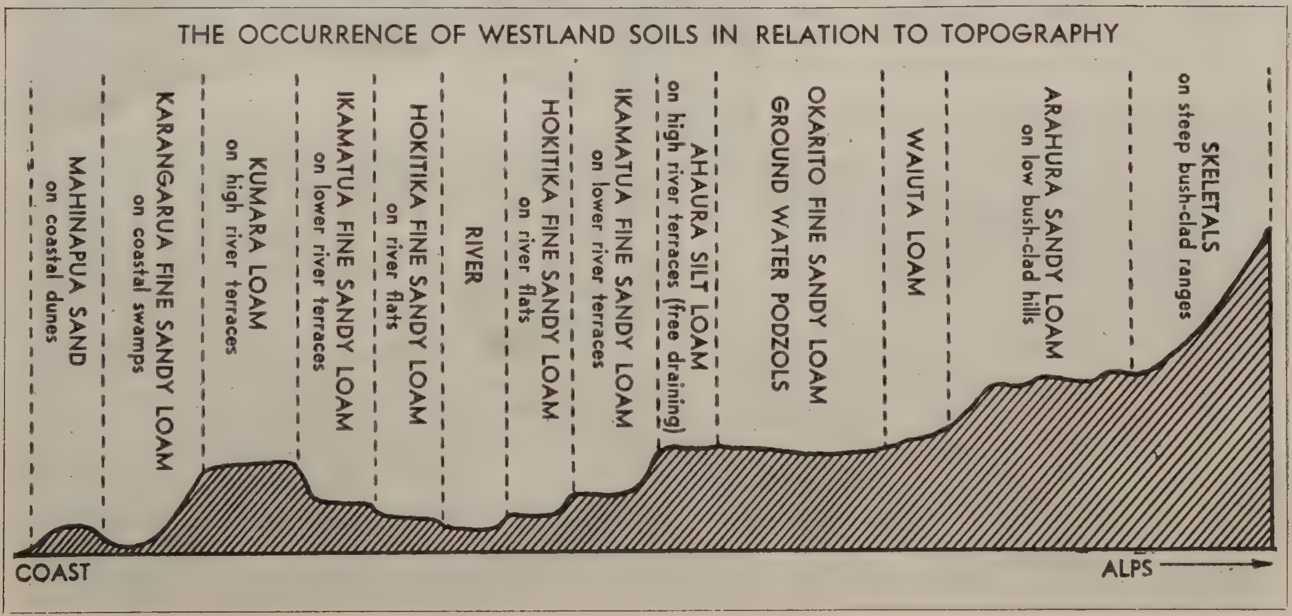
Subdivision of the terraces and low foothills into two groups is necessary because of the variation in type according to topography.

Lower terraces: The soils of this type are loose and free draining, being sandy loams overlying gravels (Ikamatua sandy loam). They have been developed from alluvial deposits and are on terraces above flood level. These soils are as fertile as the river flats and the majority have been developed and are utilised for sheep and cattle grazing.

High-level terraces: These soils are of old alluvial origin, and there is a variation between the flatter portions and the undulating to hilly portions. They are shallow, being sandy loam and stony sandy loam on gravels (Ahaura stony sandy loam and Arahura sandy loam). The fertility level is low to medium, but where the topsoil is sufficiently deep dairy farms and grazing runs have been established; the remainder, mainly of low fertility, has reverted to second growth because of the impracticability of clearing and topdressing. In many instances the provision of water for stock presents difficulties. The Grey Valley has good examples of both of these types.

Pakihi Lands

The poorly-drained high-terrace soils are commonly known as pakihi. Technically they are ground water podzols which have been developed from sandstone and granite gravels. Leaching



THE OCCURRENCE OF WESTLAND SOILS IN RELATION TO TOPOGRAPHY

MAHINAPUA SAND
on coastal dunes
KARANGARUA FINE SANDY LOAM
on coastal swamps
KUMARA LOAM
on high river terraces
IKAMATUA FINE SANDY LOAM
on lower river terraces
HOKITIKA FINE SANDY LOAM
on river flats
RIVER
HOKITIKA FINE SANDY LOAM
on river flats
IKAMATUA FINE SANDY LOAM
on lower river terraces
AHAURA SILT LOAM
on high river terraces (free draining)
OKARITO FINE SANDY LOAM
GROUND WATER PODZOLS
WAIUTA LOAM
ARAHURA SANDY LOAM
on low bush-clad hills
SKELETALS
on steep bush-clad ranges
COAST
ALPS

COAL AND TIMBER ON THE WEST COAST

First gold, then coal and timber, and now increasingly agriculture: That has been the history of Westland expressed in terms of land usage. After the richest of the gold deposits which first drew wealth seekers to the west coast in the 1860's had been worked out, attention was turned to coal and timber resources, which had the effect of hastening the opening up of the country for farming. Gold mining and dredging appear to be a dying industry, but coal and timber still bulk large in the district's economy. However, agriculture is filling an increasingly-important role and the province promises to continue its march toward a place among New Zealand's primary-producing districts.

Above—Denniston is one of the places producing the hard coal for which the Westport district is famed. Perched on top of the Mount Rochfort plateau, it illustrates the difficult country into which Man has been forced to pursue his quest for coal. Right—Blackball is a coal-mining town near Greymouth. The gold dredge with its scar of tailings in the left background is a reminder of the impetus which the discovery of gold gave to the settlement of the west coast. Lower left—The sawmill near Ross, on the southern terminal of the west coast railway system, is one of the largest in New Zealand, drawing timber from a very wide area of Westland. Lower right—Ruatapu, near Hokitika, is typical of Westland's sawmilling towns.

[V. O. Browne photos.

has been strong, and during the process all plant foods have been removed and iron and humus have gradually accumulated in the subsoil, cementing a layer of stones into an impervious pan. This pan is an effective bar to drainage, and the soil overlying it is almost continuously waterlogged.

Because of a considerable variation in the depth of soil above the pan, these soils fall into two categories, but in general one type exists on the ridges and terraces (Waiuta loams) and the other on the flatter land (Kumara and Okarito loams). Vegetation varies from gorse and manuka to rimu, miro, and kamahi timber on the higher levels; scattered depressions are covered by umbrella fern, moss, and sedges, with numerous silver pine roots underground, but are devoid of living timber on the surface.

The popular term "pakihi" is very loosely applied to a wide range of soil types of low fertility, whereas it should refer only to those soils devoid of forest and plant nutrients, as the Maori word "pakihi" means "clearing in the bush." These soils are extremely low in calcium and phosphate; if these are applied in sufficient quantity, quite good pastures can be established, but their utilisation is confined to dry-weather grazing. To date none of the soils has been converted into good farming land.

The pakihi soils around Westport have been derived from quartz grits and sands as well as from granite gravels. They are poorer and more difficult to develop than those described and are fully dealt with in Bulletin 71, "Soil Survey of Westport District," of the Department of Scientific and Industrial Research.

Lower Ranges

Practically all the steep hill land of Westland is still covered by native bush, and nowhere have farms been established on this class of land. The soils are very shallow, and if the present ground cover were removed, erosion would result because of lack of soil stability and increased water run-off. These soils consist mainly of freshly-weathered soil and disintegrating rock fragments and are classified as skeletal. This class of land is unlikely ever to be of any use for farming.

[V. C. Browne photo.

Westland is a rugged region of three levels—the steep mountain ranges, the terraces and lower ranges, and the narrow coastal plain of varying width.

Land Utilisation

Of a total area of about 5,690,000 acres in the district some 1,170,000 acres are occupied; the unoccupied area of 4,520,000 acres comprises mainly native forest land and barren and snow-clad mountain tops.

Of the occupied area about 980,000 acres are classed as unimproved land, consisting in the main of areas which have reverted to second growth. Sown-grass areas account for about 182,500 acres, and for the most part these are in the river valleys. The total occupied area in 1946-47 supported 97,300 sheep and 67,700 cattle, of which 20,300 were dairy cows in milk.

UTILISATION OF LAND AND STOCK CARRIED IN WESTLAND, 1946-47

	County				Total
	Grey	Westland	Buller	Inangahua	
Total acreage	1,010,560	2,822,400	1,248,000	607,360	5,688,320
Acreage occupied	299,561	688,826	95,727	85,536	1,169,650
Acreage unoccupied	710,999	2,133,574	1,152,273	521,824	4,518,670
Acreage in cultivation (including sown grasses)	47,842	93,501	25,094	22,155	188,592
Acreage of unimproved land (occupied)	251,719	595,325	70,633	63,381	981,058
Acreage sown in grass	47,058	89,260	24,687	21,529	182,534
Acreage in green fodder and root crops	570	283	118	380	1,351
Acreage cut for hay and silage	1,112	984	653	844	3,593
Number of holdings	492	679	500	245	1,916
Average acreage of holding	609	1,014	191	349	610
Total sheep	32,469	43,618	2,129	19,097	97,313
Sheep shorn	30,586	36,926	2,645	16,676	86,833
Breeding ewes	23,085	34,461	1,474	13,595	72,615
Dairy cows in milk	3,856	8,445	6,058	1,950	20,309
Total cattle	17,343	30,694	12,723	6,987	67,753

Figures from "Statistical Report on Agricultural and Pastoral Production, 1946-47."

Types of Farming

The types of farming carried on in Westland cannot be grouped in any simple way, for from the point of view of size of holdings they may appear to fall into the classification of extensive farming, whereas from the management point of view they are really intensive. The average size of holding for the district is 610 acres, but in most cases an appreciable portion of this area is bush or second-growth light land, and farmers tend to concentrate on the more easily-worked portions, with the result that these areas are farmed more intensively.

The following classification outlines broadly Westland farming systems:—

Dairy Farming

Dairying is the major farming industry and utilises the greater part of the occupied improved area of all the counties. The main factor responsible for the popularity of this type of farming is the climate, with its mild temperatures, absence of cold winds, well-distributed rainfall, and plentiful sunshine. Most dairy farmers close to the towns concentrate on the production of whole milk for town supply. There are no cheese or milk-processing factories in the district.

The milking season is short compared with that in other districts with somewhat-similar climates, being from September to April, but despite this, average butterfat production per cow approaches 200lb., while the average per acre is at the low figure of 70lb., which is a reflection of the semi-improved run-off areas of the holdings. Averages of 300lb. of butterfat per cow and 150lb. per acre could well be expected, and many farmers have exceeded these figures.

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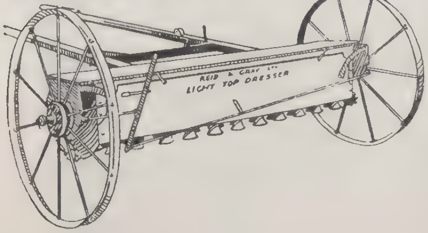

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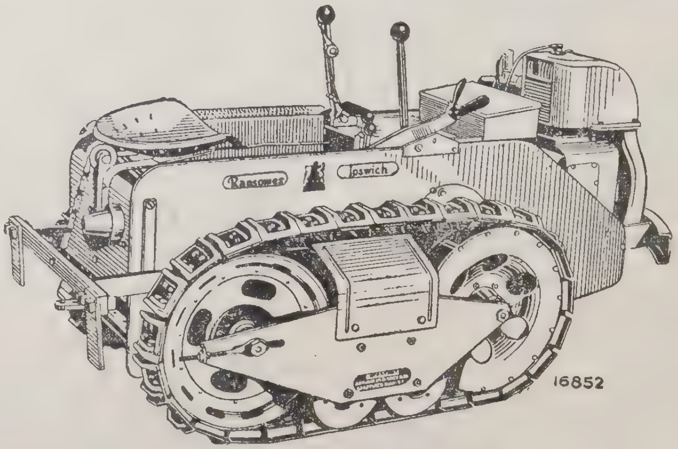

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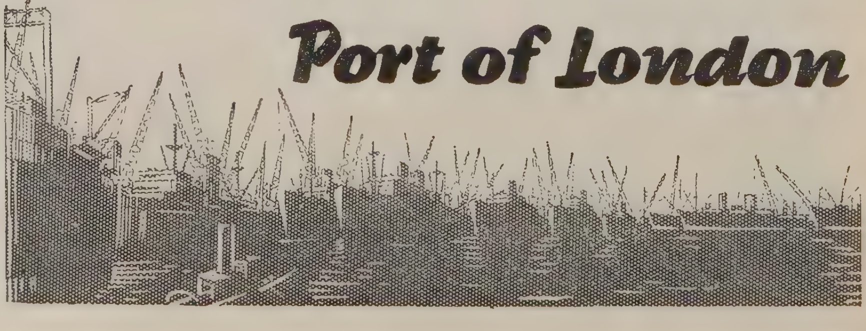


The monthly output of butter factories shows a long lag in reaching peak production. There is a short season of high production and a rapid fall after the peak has been reached, suggesting that pasture production is not being used fully and that some doubt may be cast on the practice of not beginning the season until September.

No one breed of cow is predominant, though the Jersey influence is apparent in most herds.

As might be expected with dairying for butter production, the production of pig meat is an important sideline, and considerable progress has been made during the past decade by this method of using dairy by-products, the ratio now being about 50 pigs per 100 cows milked. The improvement in the quality of the pigs can be traced to the formation of pig clubs and the institution of a recording system. Buyers from outside districts are active, and in carcass competitions major awards often come to the district. The feeding of grain and meal supplements presents supply difficulties, and because of the long haulage necessary transport costs on these foodstuffs are relatively high. Most farmers grow forage crops for winter feed. The Large White leads the Berkshire in popularity, with the Tamworth next; though crosses between these breeds are not uncommon, they appear to be losing popularity.

Sheep Farming

The main aim of sheep farming in Westland is the production of fat lambs, wool being of secondary importance, partly because country other than cleared country is very hard on wool, and sheep with the fleece dragged out are no uncommon sight. The flocks are distributed throughout the whole area with, in general, the larger flocks on the higher levels and the smaller ones on the lower dairying areas.

The aim is "fat off the mother," and this is generally achieved. Weight is of major importance, as no supplies of store lambs are available to replace drafts sold early. Therefore, lambs are kept to grow to an average of 38 to 40lb. carcass weight. The Southdown-Romney is the popular cross for fat lamb production, and on most properties a few Romney rams are kept to breed replacements for the main flock. This practice has been forced on the sheep farmer, as ewe fairs are not held in the district and the cost of bringing in replacements from outside districts is prohibitive because of transport charges.

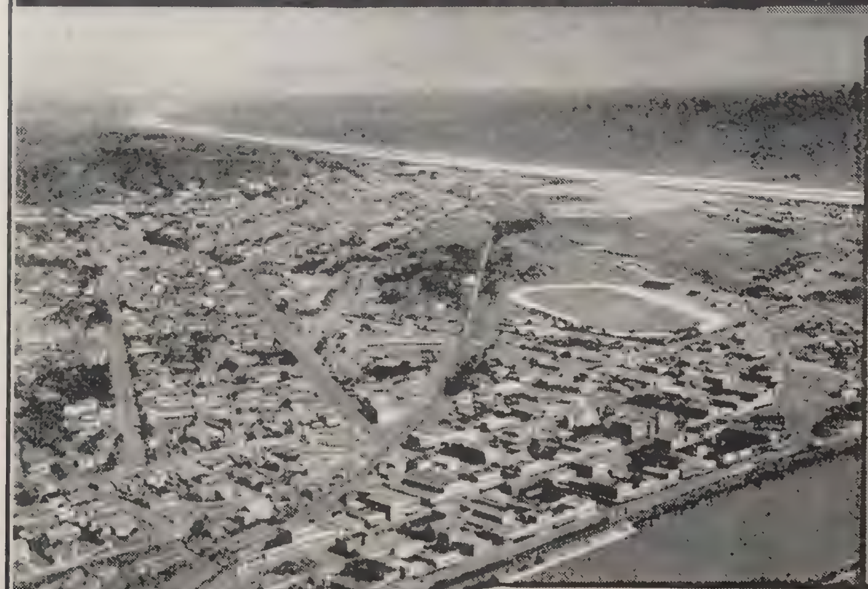
Lambing percentages in general are as high as anywhere else in New Zealand, which is rather remarkable, as ewes cannot always be classified as paddocked at tupping time. The nearest killing works are in Canterbury and lambs are railed there for slaughter, the numbers being about 30,000 a season, which suggests that fat lamb production is far from fully exploited. Dry sheep are mainly maiden ewes, carry-over white face wether lambs, and cast ewes; apart from maiden ewes for flock replacements, they are disposed of fat as quickly as possible.

Cattle Farming

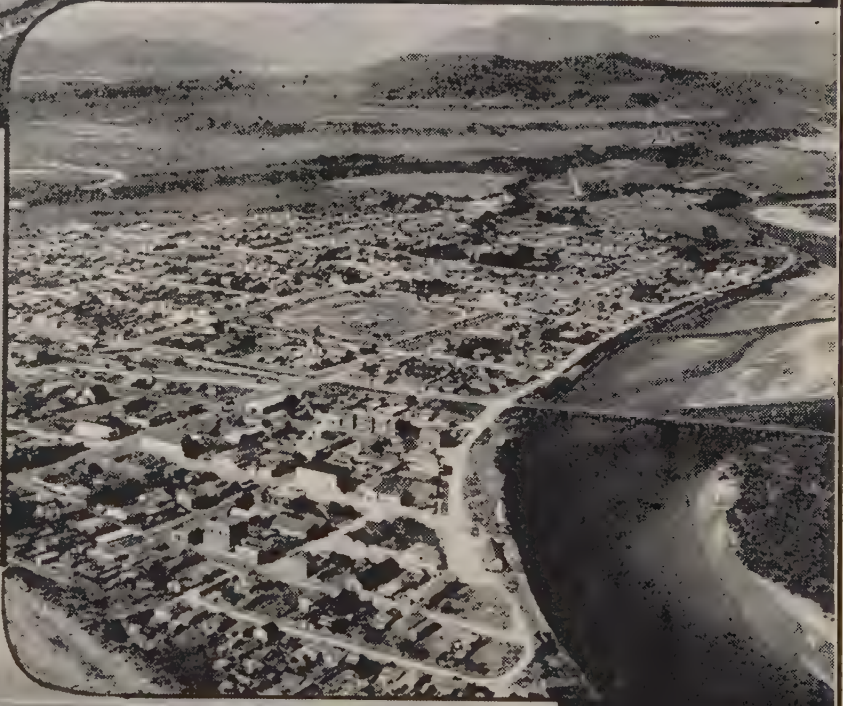
The production of beef is a feature of farming throughout the district and is carried out on the better types of

Westland was originally covered with dense bush extending from the shores of the Tasman Sea to very near the snow line of the Southern Alps. Large areas are still covered by virgin forest, particularly on the steeper hill country, and it is extremely doubtful whether the breaking in of more virgin country is yet warranted. However, on much of the flat and easier land axe and fire accounted for the bush and forest, though not all this country has been put to agricultural use. On many of the early bush-burn areas sheep have retreated in the unequal struggle against second growth, but a large proportion of such land is capable of improvement.

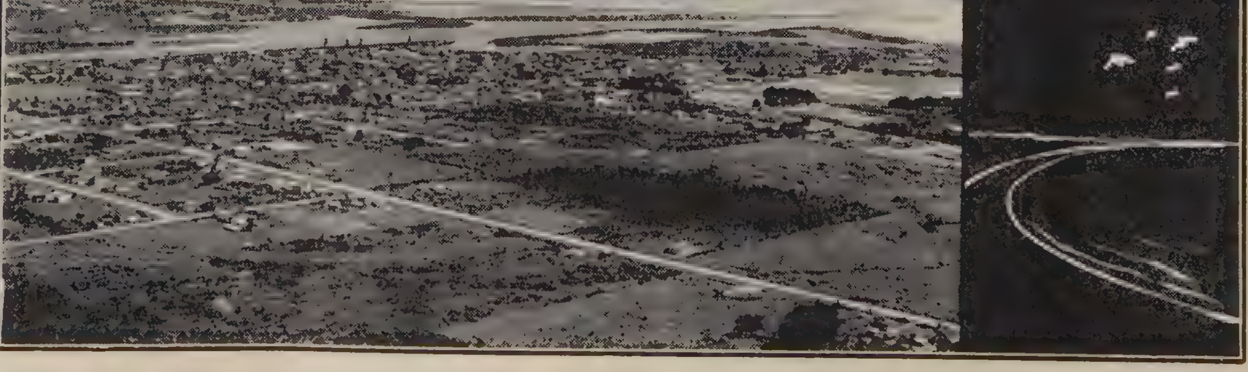
THE HARBOURS OF THE WEST COAST



In the early days of its development Westland depended solely on sea transport for links with the rest of the country. After the opening of the Otira tunnel in 1923, and later the connection of Westport with the South Island railway system, the district's three harbours of Hokitika, Westport, and Greymouth receded in importance. Now Greymouth and Westport handle little but coal and timber, and the port of Hokitika is used infrequently by ships.



Greymouth (above) is now the commercial centre and chief town of Westland and has a population of nearly 8500. Hokitika (right) was once the administrative centre of Westland and during the gold-mining boom was the chief town of the province. Westport (below) is the principal town and port of the northern part of the district and the outlet for a considerable portion of the production from the Buller coalfield.



[V. C. Browne photos.

[V. C. Browne photo.

The land around Karamea, 60 miles north of Westport in Buller County and the most northerly settlement on the west coast of the South Island, is used principally for dairy farming.

low country and the swamps and roughly-cleared bushland of the wetter, southern part of the district. All phases are covered, from the production and rearing of store cattle on areas unsuitable for other types of farming to the fattening and finishing off of beef beasts on the sheep farms of the flats. Some farmers concentrate on the fattening of cattle alone and do not bother with sheep, but such holdings are in the minority.

No one breed is predominant. Polled Angus and Hereford dispute favouritism according to class and type of country, but the Polled Angus no doubt will take the lead, as this beast is hardy and a good fossicker for food. Crosses between these breeds and the Shorthorn also have their admirers.

Except on a few of the low-country farms, no provision is made for winter feed for cattle, reliance being placed on grazing in the bush areas, to which the cattle are given access and where they winter remarkably well and come forward in spring in good store condition and ready to be fattened.

The beef industry is of some importance in the district, the low cost of production and the high price of winter beef on the Christchurch market, where most of it is disposed of, making it a profitable enterprise. About 1800 head are sent to Christchurch during the winter season. No great expansion of this industry can be expected, for with subdivision and closer settlement some of the areas producing beef at present would become dairying areas.

Mixed Farming

Mixed farming in the usual sense does not exist in this district, though holdings carrying both sheep and cattle are not uncommon. Most sheep properties run some beef cattle to condition the pastures for the sheep, and a few dairy cows are milked for domestic requirements. Some of the beef-producing holdings carry small numbers of breeding ewes for fat lamb production. In the past many beef producers ran large flocks of ewes, but they proved too hard on the pastures and farmers were forced to reduce considerably the number of sheep carried.

Pastures

The content of Westland pastures may be broadly classified into four groups:—

Sown species, which comprise ryegrass, some timothy and cocksfoot, and white and red clover. Unless management is good, these species seldom remain dominant in the sward for more than two to three seasons, when volunteer species such as Yorkshire fog, browntop, and *Lotus major* begin to come in, as well as buttercup and flat weeds.

Lotus major and Yorkshire fog, with 15 to 25 per cent. ryegrass and white clover and a little timothy and red clover. This is the type of pasture which establishes itself naturally when conditions are not suitable for the establishment of the high-production species.

Lotus major, browntop, Yorkshire fog, and sweet vernal. This type of pasture has evolved following the sowing down of the early bush burns. It is typical of the higher river terraces, but is also present in most parts of Westland where pasture improvement has not been the practice.

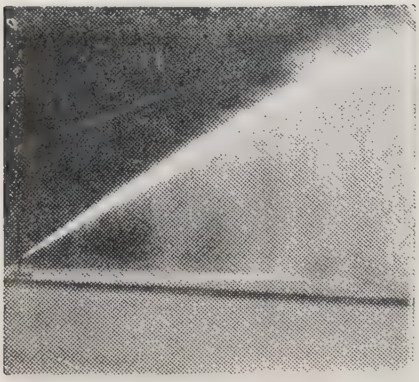
Wet pastures, consisting of *Lotus major*, floating sweet grass, and *Poa annua*, in conjunction with rushes and sedges. These species are found on the poorly-drained areas by themselves, and also in conjunction with any of the other groups in localised areas of poor drainage.

These four broad groups are scattered throughout the district and are not peculiar to any one area. The major portion of the district's production is obtained from the first three groups.

During recent years there has been a definite trend toward better-quality pastures, some of the factors responsible being subdivision of the larger areas, the ingress of second growth on the lighter portions of properties and the consequent necessity to increase revenue from the remaining better portions, and the realisation of the improvement obtained from the use of lime and phosphate.

Improvement methods fall into two groups, a short-range and a long-range programme, and, though both are successful to a degree, the ideal is a combination. The short-range method is to topdress the rough pastures with lime and phosphate with a view to improving them and stimulating the ingress of volunteer white clover, which abounds in the district; this is satisfactory in that it gives a reasonable production per cow, but production per acre is still low. With the long-range method areas are cultivated to provide one or more forage crops and then sown down in high-producing species of grasses and clovers with adequate lime and phosphates; thus both production per acre and production per cow are improved.

The improved strains of grass and clover seeds available as a result of the certification scheme of the Department of Agriculture, though not having as great an influence on pasture improvement in Westland as in other parts of the Dominion, nevertheless have been partly responsible for the progress made to date. Where these seeds have been used on the more fertile areas good pastures of perennial ryegrass, timothy, crested dogstail, and white and red clover, with Yorkshire fog and *Lotus major*, have been established. However, farmers still tend to refrain from sowing clovers because of the attitude that "there is plenty in the ground." Where pasture improvement is practised seriously farmers whose utilisation is good by present standards achieve a greater measure of success in holding the higher-producing species in the sward than those whose utilisation is not as good.



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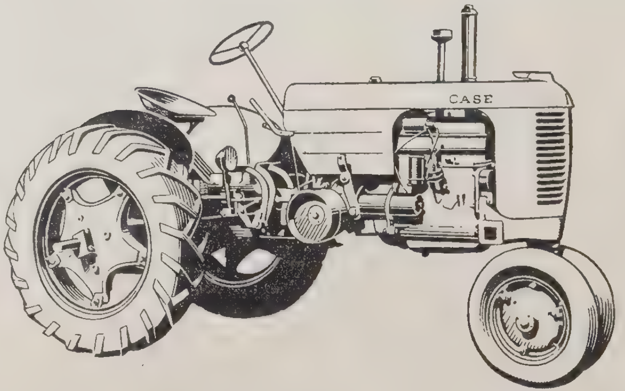

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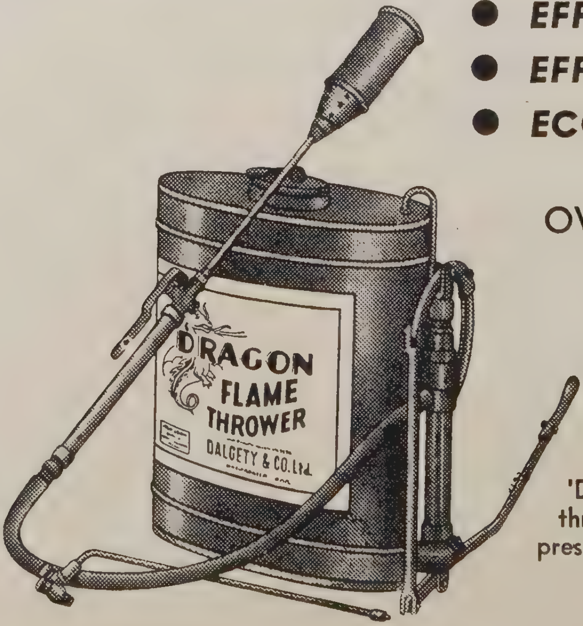

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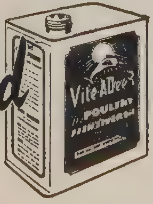
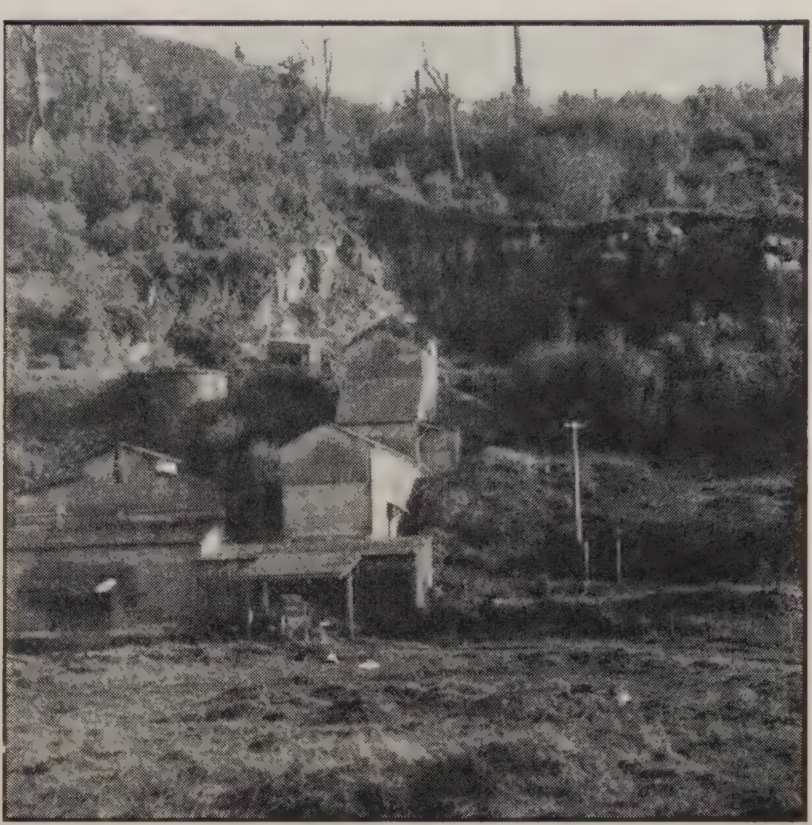




The limeworks at Koiterangi is one of five operating in Westland. Initial dressings of 1 ton of lime per acre and similar applications annually for 3 or 4 years are necessary on west coast farmlands.

Though topdressing with lime and phosphates is a necessary first step, and the results thus obtained from secondary swards are satisfactory, it is essential that in future these pastures be replaced by high-producing swards as the fertility level is raised. In addition, the reluctance to sow clovers because the volunteer type is already there will have to be overcome.

Lime

Farmers now realise that the use of lime is necessary for pasture improvement in Westland. The following figures do not give the exact position, because a considerable tonnage is carried by road transport operators, but they show the trend.

	Tonnage of lime delivered at railway stations in Westland
1937-38	1,562
1940-41	3,173
1946-47	4,102
1947-48	3,666

The increase would probably have been greater if the supply had kept pace with the demand.

The lime requirements of the soils of Westland are high. Initial dressings of 1 ton per acre and subsequent applications of up to the same amount each year for 3 or 4 years are necessary to overcome the high degree of soil acidity and loss by leaching caused by the high rainfall.

Limeworks are operating at Ross, Koiterangi, Cape Foulwind, Rahu, and Karamea, their annual production totalling a little more than 9000 tons. Deposits of limestone ranging in quality from fair to good are numerous in the northern part of the district from Greymouth to Westport, up the Buller Gorge to Murchison, and in the Maruia Valley up to the Lewis Pass.

Phosphates

Westland farmers were just realising the necessity and importance of phosphatic topdressing when wartime rationing was enforced.

	Tonnage of fertilisers delivered at Westland railway stations
1937-38	1,926
1946-47	2,423
1947-48	2,909

The desirable rate of phosphate application is 2 to 5cwt. per acre yearly, according to the soil type, in the early stages of a topdressing programme. As in the remainder of the South Island, little if any response is obtained from phosphate unless lime is applied, preferably before the phosphate.

Production Trends by Counties

Buller

Of a total area of 1,248,000 acres in Buller County only 95,727 acres are occupied in 500 holdings, the average acreage being 191. The unoccupied area consists of rough, bush-clad ranges, second-growth terraces and lower hills, and pakihi lands; the pakihis are about half of this area.

Statistics indicate a gradual decline in all farming up to 1947. In 1920 dairy cows in milk numbered 4051, increasing to 6518 in 1940, then declining to 6058 in 1947. Sheep numbers declined from 5137 in 1920 to 2129 in 1947, and during the same period other cattle decreased from 8075 to 6671. Though not alarming, the situation is disturbing, as a definite reason for this decline is difficult to determine; factors probably contributing are reversion to second growth, amalgamation of holdings, and economic difficulties. Being a mining and timber district with restricted areas of better-class land, the county has never been a strong primary production area, but it has about 10,000 acres of grazing land capable of some improvement. However, no great expansion will take place until means are found to handle the pakihi lands economically.

The two butter factories in the county have a combined output of 550 tons a year, which is more than comparable with that of the other counties, indicating that, though dairy cow figures are declining, quality beasts are being retained.

Inangahua

The position is a little brighter in Inangahua County. In 1920 dairy cattle totalled 1730, increasing to 2905 in 1935 and declining to 1950 in 1947. During the same period numbers of other cattle fluctuated from 4227 in 1920 to 4530 in 1935, falling to 4503 in 1940 and improving to 5037 in 1947. On the other hand sheep numbers increased steadily from 11,139 in 1920 to 19,097 in 1947.

The total area of the county is 607,360 acres, of which 85,536 are occupied in 245 holdings of an average area of 349 acres. The land may be classed as light second-class, and only about half is suitable for dairying in its present condition, which probably explains in part the trend toward sheep farming. The ingress of second growth is fairly rapid on this land if given any chance. Much of the existing improved and semi-improved country is capable of greater development, and a considerable part of the occupied unimproved area of 63,381 acres is capable of some improvement, but no remarkable changes or increases are to be expected.

The county has one butter factory, a branch of the factory operating in Grey County, whence part of its supply is drawn.

Grey

The position in Grey County is similar to that in Inangahua County. Numbers of dairy cows in milk fluctuated from 3882 in 1920 to a peak of 4846 in 1934 and back to 3856 by 1947. Other cattle and sheep increased gradually during the same period, cattle numbers rising from 11,915 in 1920 to 13,487 in 1947, and sheep from 27,370 to 32,469.

The total area of the county is 1,010,560 acres, of which 299,561 acres are occupied in 492 holdings of an

[*V. C. Browne photo.*

The middle levels and coastal flats of Westland are dissected by valleys such as the Ahaura Valley, drained by fast-flowing creeks and rivers.

average of 609 acres; the occupied unimproved acreage is 251,719 acres, a reasonable percentage of which is capable of further development. Here the concentration on the better-class areas of properties is more marked.

The trend is away from dairying. Butter-production figures are relatively low, 450 tons being the combined annual output of Inangahua and Grey Counties, suggesting that feed is not being utilised fully and that herds may contain a considerable number of low-producing cows.

Westland

Of a total area of 2,822,400 acres in Westland County 688,826 acres are occupied in 679 holdings of an average area of 1014 acres; the occupied unimproved area is 595,325 acres, a considerable proportion of which is capable of some improvement.

In 1920 cows milked numbered 4250, by 1940 the figure was 8972, but this declined to 8445 by 1947. Other cattle increased from 20,514 in 1920 to 22,249 by 1947. Sheep numbers improved from 38,730 in 1920 to 53,507 in 1930, declining to 43,426 in 1935 and 43,618 in 1947.

The two butter factories in the county between them produce 870 tons of butter.

No expansion of note is likely until the importance of subdivision is realised.

Prospects for Future

Within the four counties an estimated 120,000 acres utilised for grazing, much of which is improved or semi-improved, can be developed further. In addition, a considerable part of the unimproved occupied acreage is capable of improvement, particularly that part which consists of early bush-burn areas from which sheep have retreated in the unequal struggle against second growth. It is extremely doubtful whether the breaking in and settling of virgin country is yet warranted. Improvement of existing occupied areas can be brought about by a number of factors, including the use of good-class pasture seeds and of lime and phosphates.

The adoption of a policy of winter-grass conservation for late-winter and early-spring feeding would be advantageous on most properties, as would the growing of areas of greenfeed and roots, alone or in conjunction with the saving of winter grass. The saving of hay is subject to risk unless left until autumn, when the weather is more settled, but then the quality of the material saved is not good. The making of silage is recommended, and areas cut for silage in November-December recover well and provide a succulent aftermath well into autumn.

Herd improvement is also necessary. The support accorded group herd testing is comparable with that in other dairying districts in that about a quarter of the cows milked are under test, but an improvement on that figure is to be expected.

Westland is a young man's district and, given young, energetic men with initiative and imagination, it is one which should eventually take its place among New Zealand's primary production districts.

Acknowledgment

The section on soils was compiled from data made available by the Soil Bureau of the Department of Scientific and Industrial Research.

[*V. C. Browne photo.*

Harihari is a dairying district to the south of Hokitika.

The Value of a Herb Garden

By A. G. KENNELLY, Vegetable Instructor,
Department of Agriculture, Christchurch.

TO the experienced cook and to the true garden lover alike a well-planned and well-established herb garden offers an endless source of pleasure. A herb garden which forms part of the home vegetable garden is usually dominated by plants grown for flavouring or garnishing, but the attractiveness of the herb garden is likely to be greatly enhanced if plants are also included for medicinal use, for use in beverages, for their scents, making perfumes, filling sachets, dye, confectionery, or to attract bees. A herb garden established in a weed-free situation requires very little attention, particularly if most of the plants are perennials.

WEED control in the herb garden must be rigorous, and plants such as mint which tend to encroach on others should either be chopped back regularly or planted where their spread will do no harm. A piece of tin sunk into the ground around them is usually effective. It need not show from above. Some home gardeners use the top of an oil drum; a 5-, 10-, or 40-gallon drum may be used.

Common Herbs

Herbs such as parsley, mint, sage, chives, and thyme should be grown in practically every good-sized home garden.

Parsley is usually best sown twice a year. A sowing can be made now if the soil is well drained, as seed is frequently slow to germinate. Seedlings should be thinned early and spaced 10 to 12in. apart. Liberal spacing is desirable, as plants then have less tendency to run to seed prematurely.

Mint is usually propagated by rooted cuttings of the creeping or underground stems. In gardens inclined to be dry it should be planted under or near a water tap. Its tendency to spread when conditions suit it can be overcome by surrounding it with a sheet of tin about 8in. deep.

Sage is usually grown as a perennial and is usually propagated by cuttings chosen from good stock. There are two kinds of common sage. The broad-leafed kind, which flowers little or not at all, is usually preferred, though the narrow-leafed kind is also valuable. Sage grows up to 14 to 16in. tall and should be set out about 18in. apart in a warm situation. It is probably the most commonly used of all herbs for seasoning.

Chives have tops like spring onions and are propagated by division. Clumps can be replanted each year from late autumn until early spring any time conditions are favourable. They should be set out about 12in. apart and clumps cut regularly in succession to ensure a supply of young leaves. The leaves of chives are used similarly to spring onions, though they are milder than most varieties of spring onions. They are useful chopped and placed in sandwiches and salads or mixed in scrambled eggs. Usually they are grown in clumps, but rarely the clumps are completely broken up and individual "bulbs" are set out about 2in. apart and grown on to be used like spring onions.

Thyme is of two principal kinds—common and lemon. Both are perennials and are propagated by seed, the breaking up of clumps, and by cuttings; plants should be set out about 12in. apart on a reasonably dry, well-drained border. Good drainage is important, as thyme readily suffers injury in wet soil conditions. Other interesting kinds of thyme are the silver, orange, and golden varieties. In addition, there are several varieties of wild thyme.

Though practically every large-sized garden in the Old World includes a herb garden where plants are grown for their beauty and fragrance or for medicinal or culinary uses, people in New Zealand are in general less familiar with and thus less appreciative of herbs than people, particularly country people, in the Old World.

Many home gardeners in New Zealand feel that they cannot afford the space and the time required for the upkeep of a large herb garden, but where herbs are appreciated a small border or corner at least should be set aside for their cultivation. A herb garden will be valued by the housewife not only for its utilitarian worth, which she will appreciate in her capacity as cook and housekeeper, but for the quaintness, fragrance, and beauty of the plants themselves. In addition, most busy housewives will appreciate the air of peace which a well-established herb garden offers.

Herb Edgings for Paths

Apart from their use in formal herb gardens, many herbs can be used very effectively as edgings for paths, and in addition some prostrate herbs will greatly enhance the attractiveness of paved paths if planted in the interstices of the flagstones. Where traffic is light and reasonable care is taken by weeding and not walking on them in wet weather good paths can be made entirely of herbs such as the prostrate varieties of thyme, mint (*Mentha requienii*), calamint (*Calamintha alpina*), English pennyroyal, and burnet.

Where ground space is lacking, herbs can also be planted in holes cut in a barrel or steel drum in the same way as is sometimes used for strawberries. If it is desired to move the barrel occasionally, the centre should be filled with a box made by nailing three or four planks together at the edges or by placing tightly-packed straw in the centre.

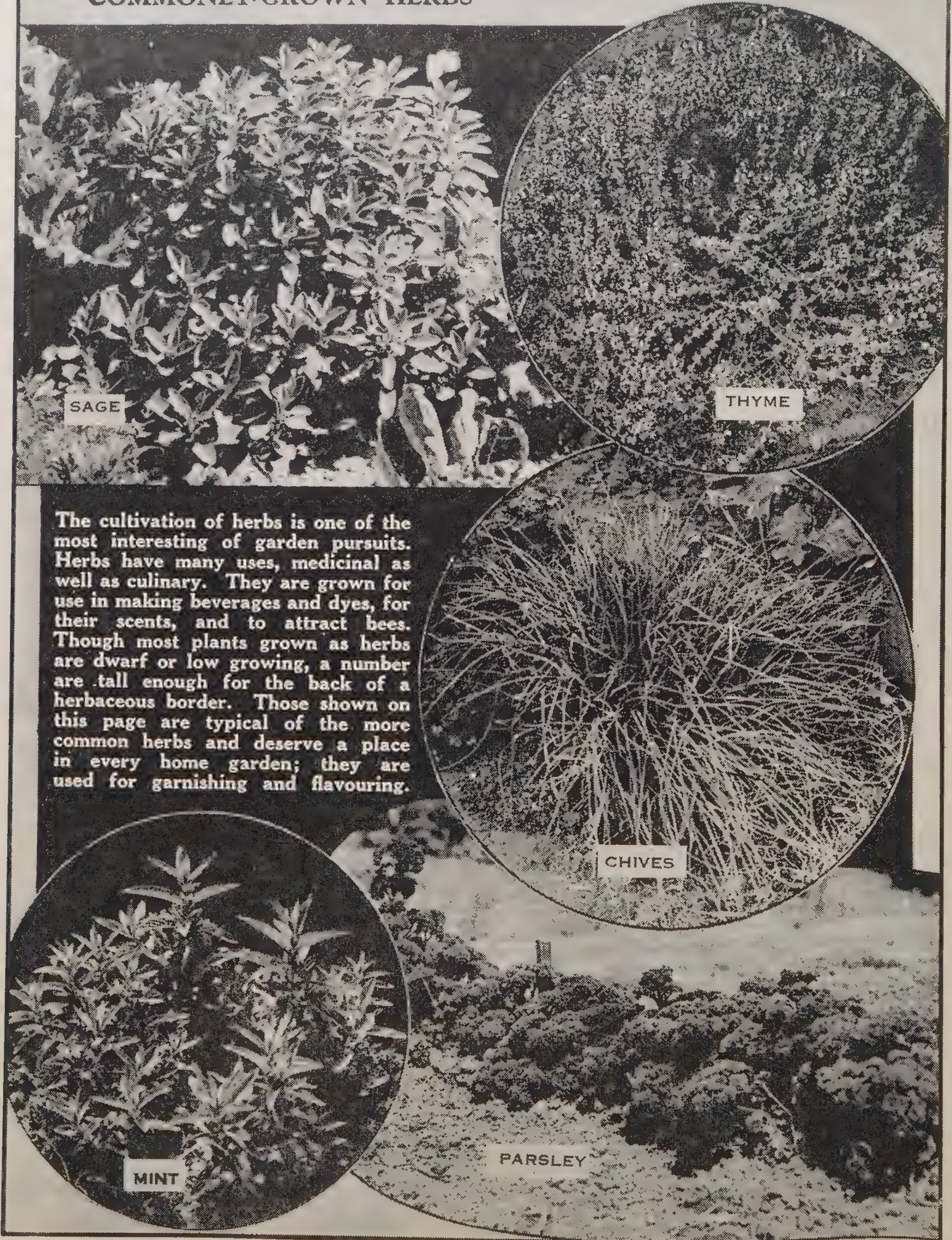
Use in Rock Garden

A small rock garden planted with herbs also makes quite an attractive garden feature. Dwarf or low-growing herbs should be chosen except for backgrounds or screens. If desired, the herbs can be interplanted with alpines or similar subjects which are

[*Green and Hahn Ltd. photo.*

Lemon (common) balm is a herb grown for its fragrance.

COMMONLY-GROWN HERBS



The cultivation of herbs is one of the most interesting of garden pursuits. Herbs have many uses, medicinal as well as culinary. They are grown for use in making beverages and dyes, for their scents, and to attract bees. Though most plants grown as herbs are dwarf or low growing, a number are tall enough for the back of a herbaceous border. Those shown on this page are typical of the more common herbs and deserve a place in every home garden; they are used for garnishing and flavouring.

[*Green and Hahn Ltd. photos.*

more usually grown in the rock garden. Low-growing herbs useful for rock garden planting are the thymes, calamint, pennyroyal, English chamomile, violets, thrift, sweet woodruff, chives, catnip, sage, dwarf basil, nasturtium, winter savory, and dwarf lavender.

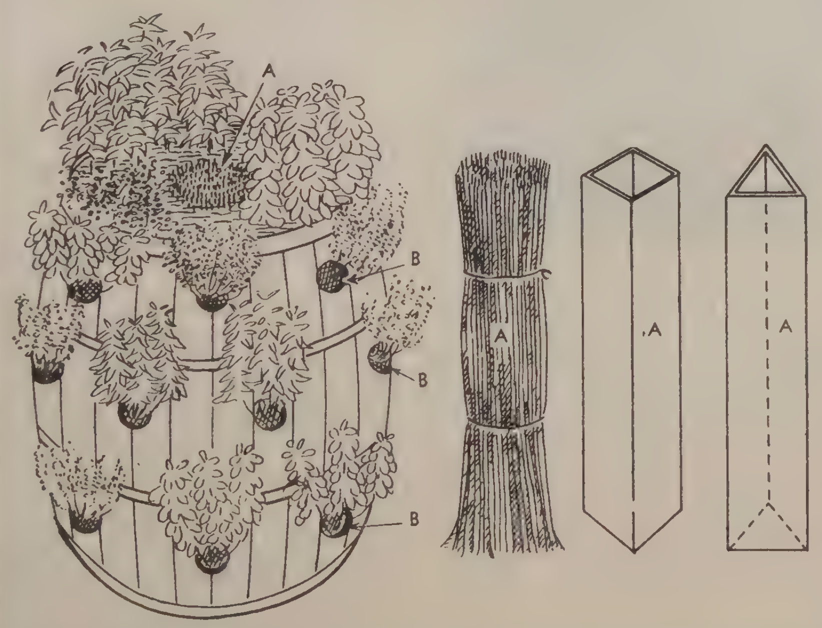
For those who prefer to confine their attention to a few fragrant and simply-grown herbs the different varieties of mint, thyme, and sage offer many possibilities. *Mentha requienii* is especially useful for a path in a shady part of the garden. It is one of the most fragrant mints, probably exceeded in fragrance only by *Mentha citrata* (sometimes called bergamot mint). Apple mint (*Mentha rotundifolia*) is a stately plant often used in the herbaceous border. Especially-good strains grow up to about 5ft. high.

Varieties of spearmint (*Mentha spicata*) are most commonly used for mint sauce, though horse mint, *M. longifolia* (syn. *sylvestris*), is also used. Horse mint is occasionally seen growing wild, but is less used because of its downy leaves. There are the two varieties of peppermint (*M. piperita*), white (var. *officinalis*) and black (var. *vulgaris*), from which oil is obtained, and *Mentha pulegium*, or English pennyroyal, a herb popular for medicinal purposes.

[*Green and Hahn Ltd. photo.*

Borage can be used in salads, as a pot-herb, for flavouring, or to attract bees.

Varieties of thyme are even more numerous. Garden thyme is usually listed as *Thymus vulgaris*, and wild thyme as *T. serpyllum*. The little Corsican thyme (*T. herba-barona*) is commonly grown in rock gardens. It has a strong and attractive scent and because of its prostrate habit and strong growth is also used for growing on flagstone paths. There are some very fine varieties grown as garden thyme. The commonest of them, usually known as *T. vulgaris citriodorus*, is now listed by botanists as *T. serpyllum vulgaris*, and is very attractive. There are a number of varieties of it, some of which are very popular. The variety known as *T. fragrantissimus* is much sought after, but is rarely seen. Paths made of thyme are fairly enduring, though they do not stand up to heavy traffic. Postrate varieties of *T. serpyllum* are most used. *Thymus serpyllum lanuginosus* (a plant often grown in rock gardens) and varieties closely related to it are good for the purpose, though the more colourful *T. serpyllum coccineus* is also popular. *T. serpyllum citriodorus* is usually considered to have the finest scent of the different varieties of thyme. There are numerous other varieties of thyme, including attractive plants which grow over 1ft. high, but the foregoing is sufficient to indicate some of the possibilities of the genus.



In gardens where there is insufficient space for growing herbs in the ground they can be grown in a barrel or drum. Holes are cut in the barrel and the herbs planted in the same way as is sometimes used for growing strawberries. If the barrel has to be moved, the centre should be filled with a box or tightly-packed straw to lighten its weight. A—Straw packing or wooden box to lighten barrel. B—Holes cut in the side.

Sage affords a more limited number of useful varieties. Apart from the common sage (*Salvia officinalis*), which is obtainable in two main varieties, the narrow grey-leafed and the seedless broad green, the best-known sage is *Salvia sclarea* or clary. It is a very fine herb and looks well in the herbaceous border. Though common clary usually grows only about 3ft. high, some varieties grow up to about 5ft. Clary has a very strong scent which can be detected at some distance. Decoctions of clary are used for bathing the eyes. In addition to the foregoing varieties, there are a number of other interesting sages. Some of the finest-scented sages would probably be difficult to obtain in New Zealand, but those mentioned and other ornamental sages are available.

Selection of Herbs

Perhaps the simplest way for a beginner whose knowledge of herbs goes little beyond the old standbys such as chives, parsley, mint, sage, and thyme to make a selection of plants for a herb garden is to choose herbs

THE VALUE OF A HERB GARDEN . . .

from lists in which they are grouped according to the purpose for which each is commonly grown. A selection could be made from the following (the parts of the herb used are given in parentheses):—

Used in Salads

Anise (leaves), basil (leaves), borage (young leaves), calendula (flower petals), caraway (leaves), cardoon (blanched inner leaf stalks), chervil (leaves), chives (leaves), chicory (roots, blanched shoots, and leaves), dandelion (leaves), dill (flowering umbels and leaves), house leek (leaves), lemon balm (leaves), New Zealand spinach (leaves), nasturtium (leaves, petals, and pickled seed), rampion (cooked roots and leaves), sampire (pickled shoots), summer savoy (leaves), sorrel (leaves), sweet marjoram (leaves), tarragon (leaves), thymes (leaves).

Boiled as Vegetables (Pot-herbs)

Borage (leaves), cardoon (blanched inner leaf stalks), chicory (leaves, roots), chenopodium or Good King Henry (leaves), hops (young shoots), lovage (leaves), New Zealand spinach (leaves), orache (leaves), poke weed (tender shoots), rampion (roots and leaves), skirrit (roots), sorrel (leaves), tampala (leaves), white mustard (seed leaves and immature stems).

Used for Flavouring

Grown for Seeds: Anise, caraway, coriander, cumin, dill, nasturtium, sesame.

Grown for foliage: Angelica, basil, borage, burnet, chervil, chives, lovage, mints (various), parsley, rosemary, sage, savory, sweet bay, tarragon (French), thyme.

Grown for Fragrance

Medium-tall to tall plants: Angelica, bergamot, common tansy, fern-leaf tansy, daphne, dill, dropwort, lemon balm, lovage, pineapple sage, sweet bay, sweet cicely, southernwood, sweet wormwood.

Dwarf to Medium-tall: Basil, burnet, calamint, chamomile, catnip, clove pink, dame's rocket, English pennyroyal, feverfew, heliotrope, hyssop, lavender, marjoram, mints, nasturtium, rose geranium, rue, sage, sweet maudlin, sweet woodruff, sweet marjoram, sweet basil, thymes, tarragon, violets, winter savory, yarrow.

Herbs which Attract Bees

Basil, borage, catnip, chamomile, chicory, daphne, dropwort, foxglove, germander, hyssop, Italian bugloss, lavenders, marjorams, melilot, red bergamot, rosemary, sweet cicely, sage, teasel, thymes, winter savory.

The common herbs such as parsley, thyme, sage, and mint can be obtained from practically all seedsmen. A few seedsmen also list some of the less-common herbs, but where a comprehensive list is required it is usually necessary to go to a grower who specialises in herb production; there are several in New Zealand. At least one publishes a comprehensive catalogue of herbs which includes a considerable amount of descriptive matter on about 400 or 500 herbs or plants used for similar purposes, including a number of native plants. To those interested in herbs such a catalogue is a joy to study.

Outstanding Sturmer Apple Tree

[*News-photo Service photo.*

A STURMER apple tree in the orchard of Mr. L. O. Bousfield, Twyford, Hastings, has shown a remarkable performance over a number of years. Phenomenal crops have been harvested from this tree and usually range from 40 to 60 loose-packed bushel cases of high-quality fruit (each case well filled). The last six season's crops have been as follows: 1944, 47 loose bushels; 1945, 44; 1946, 60; 1947, 40; 1948, 58; and 1949, 43. (The 1947 crop was reduced by late frosts affecting fruit set.) Part of the tree and the 1949 crop are shown above.

The tree is in the centre of a large block of good-type Sturmer trees growing on some of the best orchard land in the district. The block of trees is about 26 years old and is understood to have been worked on Northern Spy stocks. All the trees have received similar treatment, but the outstanding tree is very much larger than the average, having a spread of 26ft., a height of 15ft., and a trunk diameter of 14in. Annual growth is consistently good all over the tree, entailing considerable thinning out and shortening back at pruning time. Fertiliser application has been light and the crop is thinned heavily each year.

It seems obvious that the stock of this particular tree is something other than Northern Spy and quite possibly of seedling origin.

The main limbs of the tree are of very heavy timber and though the branches usually hold up well under the weight of the crop, some propping has been found advisable.

—*T. CONWAY, Orchard Instructor, Department of Agriculture, Hastings.*

BOOK REVIEW

"Flue-cured Tobacco Growing in New Zealand:" R. Thomson

THIS bulletin, published by the Department of Scientific and Industrial Research, deals in a very practical way with the technique of growing and curing flue-cured tobacco types under conditions applying to Nelson, where all New Zealand commercial tobacco growing is now located. After giving a brief introduction to the subject of tobacco in general and discussing conditions of soil and climate required for its successful cultivation the author sets out carefully all the operations in growing and curing, from seed sowing to final grading, and includes a section on establishment for the benefit of new and prospective growers. The bulletin brings together in concise form up-to-date knowledge and advice on flue-cured tobacco culture in New Zealand based on experience and research gained at the Tobacco Research Station, Riwaka, Nelson. The bulletin is available from the Research Station and from the Department of Scientific and Industrial Research in Wellington at 2s. 6d. per copy.

—*N.J.A.*

Phosphate and Clovers

By P. D. SEARS, Grasslands Division, Department of Scientific and Industrial Research.

DURING the recent period of the high cost of phosphatic fertilisers farmers have had to look more carefully at their fertiliser programmes. Especially is this so in hill-country districts where the cost of hand topdressing is also increasing and is apparently militating seriously against development of this hill country.

It is essential to get clovers into all pastures. All clovers are good, but some are better than others, the New Zealand pedigree strain of white clover (as shown above) being of outstanding value.

IMPORTANT as is the correct use of phosphate in pasture growth it is nevertheless a fact that quite a large proportion of farmers have unbounded faith in superphosphate and think that the only requirement for good pasture growth is the application to their farms of large quantities of phosphate, come what may. This misconception seems to prevail throughout the country and is clearly evident from discussions both on farms and at farmers' meetings as well as from practices seen in the field. It can be claimed, of course, that such an attitude is logical, because it is justified by some of the splendid results which have been and are being obtained from the use of phosphates on grassland. However, high costs, limitation of supplies, and added difficulties of delivery and application to paddocks all call for very careful consideration by the individual farmer of the particular conditions on his own property.

The need for this very careful consideration becomes more obvious when one hears so much criticism by some farmers of the lack of efficiency in those industries servicing them in the supply, manufacture, and delivery of phosphatic fertilisers.

What Trials Showed

For the past few years the Grasslands Division of the Department of Scientific and Industrial Research has conducted a comprehensive series of field and laboratory trials on the grassland fertility cycle. They have yielded a large volume of data from which a definite pattern of action can be taken for use in the field. A good starting point from which to consider the Grasslands Division investigations is a trial designed to measure the manurial value of dung and urine and their effects on the sward. The results of this trial, in which sheep were used on a high-production sward, showed that the annual value of the dung and urine per acre was equal to about a ton of sulphate of ammonia, 17cwt. of potash salts, 8cwt. of superphosphate, and 4cwt. of carbonate of lime. Most of the nitrogen and potash was contained in the urine, which stimulated the grass growth, whereas all the phosphate and lime and some nitrogen and potash were contained in the dung, which mainly gave extra clover growth. (Full-grown dry animals, which retained practically no plant nutrients, were used in these trials. Other classes of stock retain greater amounts of plant nutrients for their own use, but over all the amount retained is small compared with the total turnover of soil fertility ingredients by the grazing animal.) Additional measurements showed that the greater proportion of the dung and urine was passed at night and it is therefore easy to transfer soil fertility by differential day and night grazing. Similar effects have been measured on hill-country trials, which show clearly the fertility transference going on within paddocks because of stock grazing and excretion habits.

Next for consideration is a trial in which the effect of clovers in the sward and of added phosphate on this sward is measured. Full details of this trial cannot be given here, but the results are set out briefly in the table on this page. The pastures without clover which received no phosphates or to which no animal manures were returned used up the initial high soil fertility rapidly and reverted to browntop, chewings fescue, and weeds, producing altogether approximately 1800lb. of dry matter, of about 13 per cent. crude protein, per acre. Such pastures, which are very similar to millions of acres of farmed pastures in New Zealand, have a carrying capacity of about 1 sheep per acre.

YIELD AND COMPOSITION OF PASTURES UNDER DIFFERENT TREATMENTS

(Period January 14, 1948, to February 14, 1949.)

Treatment	Total dry matter (lb.)	Grass (lb.)	White clover (lb.)	Red clover (lb.)	Other species (lb.)	Crude protein (lb.)	Weight P_2O_5 in herbage (lb.)	Percentage P_2O_5 in herbage
No Return of Dung and Urine								
Grass, no clovers, no fertiliser	1,777	1,760	—	—	17	269	18	1.01
Grass, no clovers, + lime and superphosphate	1,888	1,843	—	—	45	275	22	1.16
Grass + clovers, no fertiliser	9,425	4,017	4,154	1,162	92	2,398	92	0.98
Grass + clovers + lime and superphosphate	11,592	4,564	6,077	932	19	3,192	131	1.13
Return of Dung and Urine								
Grass, no clovers, no fertiliser	6,434	6,276	—	—	158	1,250	75	1.17
Grass, no clovers + lime and superphosphate	6,183	6,119	—	—	64	1,240	79	1.28
Grass + clovers, no fertilisers	15,830	10,255	5,469	58	48	4,524	177	1.12
Grass + clovers + lime and superphosphate	15,518	9,893	5,544	57	24	4,452	180	1.16

The addition of 6cwt. of superphosphate per acre per annum for the past 3 years, plus 1 ton of lime per acre, to the trial pastures which contained no clovers has brought about no worthwhile increase in production over the untopdressed series of pastures. On the other hand swards of the same grass sowings which included white and red clovers but which received no fertiliser have given an annual yield of some 9000lb. of dry matter with a crude protein yield of 28 per cent. This would carry about 7 to 8 sheep per acre.

Where the grass and clover combination had phosphate and lime applied, a yield of approximately 12,000lb. of dry matter with a crude protein yield of 26 per cent. was produced per annum, representing an increase of about 23 per cent. per annum due to the fertilisers. As can be seen from the table, none of the swards mentioned above received dung or urine from the animals grazing them, as it was collected in special apparatus and discarded. Thus a phosphate deficiency was developed in the soil, but it is important to note that added phosphate was effective in producing extra growth only where the clovers were present, because in the pure grass swards growth was limited by an inadequate supply of nitrogen, and the addition of such large quantities of phosphate as were applied made no difference to the pasture growth. However, in pastures where the nitrogen supply was adequate—where clovers were present in the sward—the addition of phosphate increased production considerably.

In another series of pastures similar to the first, but where dung and urine were returned by normal grazing, neither the pure grass swards nor the mixed grass and clover swards showed response to added phosphate except for a slight increase in the winter growth of the grass in the mixed swards. However, all swards in this latter series showed a much higher yield, especially the grass constituents, than their counterparts in the series not receiving dung and urine. This increase in grass production resulted not only in greater annual total production from the sward, but also in a better balance between grass and clover and a much better seasonal spread of production more suited to animal feed requirements.

The lack of response to superphosphate in the series of trials where dung and urine were returned by normal grazing was due to the amount of available phosphate in the soil—initially quite high—being kept stable by the return of dung. Extra phosphate in the form of superphosphate was not therefore needed. There was, however, a slight increase in winter grass growth on phosphated swards. This could be explained by the greater availability of phosphate in superphosphate than in dung at a time when soil temperatures probably are too low for maximum activity among soil organisms which break down dung to form plant food.

Hill-country Trial

A trial very similar to that last mentioned, except that it was carried out on large hill-country paddocks near Palmerston North, showed a striking increase (approximately 100 per cent.) in the production of the sward when superphosphate was applied and an oversowing of clovers made. Where the same amount of superphosphate was applied (a total of 6cwt. per acre over 3 years) without the sowing of clovers there was virtually no improvement either in the yield, composition, or palatability of the pasture.

Other trials and observations made throughout the country on both flat land and hill-country farms all show much the same trend: There is very limited response to added phosphate except where the nitrogen supply has been built up. This can be accomplished primarily by the use of clovers or in various other ways; for example, by the use of animal manures, artificial nitrogenous fertilisers, or by cultivation in a fallow. The last method not only destroys weed growth, but also aids in the breaking down of organic matter in the soil and the building up of a supply of nitrogen which can be used by the crop following the fallow.

When interpreted for practical application the results of these trials agree well with the advice which has been given for many years as an outcome of results obtained from practical farming experiences. It is essential to get clovers into all pastures. All clovers are good, but some are better than others, the New Zealand pedigree strain of white clover being of outstanding value. This species can be introduced in many ways, from ploughing and sowing on a good seed-bed right through to a simple oversowing on the existing sward. Successful establishment in all cases will depend on many factors, but the few failures which have occurred in attempting to introduce this key species into the sward are well outweighed by successes.

Clovers Need Feeding

To do their job of fixing nitrogen and producing growth, clovers need feeding. Phosphate, the main mineral deficiency in New Zealand, will be the most likely requirement, but in some places lime and/or potash will be needed in addition to, or instead of, the phosphate. In some extremely-poor soils it may even be necessary to use a little nitrogen to start the clovers.

It is also necessary to let clovers grow—constant nibbling away at these plants or allowing them to be overshadowed when they are young can kill them and undo all the good that has been done by their introduction into the sward. Vigorous growth of clovers benefits associated grass plants in the sward directly, but there is an even greater gain from the urine and dung of stock grazing on new growth. It is therefore essential that the return of dung and urine to the sward should be controlled so that each paddock receives back its true quota and the distribution on each paddock is as even as possible. The latter recommendation is not implemented easily, but practices such as harrowing, rotational grazing, elimination of "day" and "night" paddocks, and careful placing of shelter belts, gates, and water troughs are all advantageous. Shelter belts should be fenced off from stock to avoid undue concentration of the droppings of grazing animals.

After conversion of the new clover growth into dung and urine the latter will make the grass grow, but it may still be necessary to apply more phosphate to the pasture to get the maximum growth of the grass in the sward. This is because grass plants growing well take up more phosphate per acre than do clover plants, though that occurs only when grasses are adequately supplied with nitrogen.

It is possible, therefore, to get three separate responses from added phosphates: First, the response in the new grass sown on a soil in which the nitrogen has been built up by cultivation, etc.; second, the response of the clover, which can fix its own nitrogen; and third, the secondary response of grass which has been fed extra nitrogen by clovers and the dung and urine from grazing animals.

It will be agreed that the subject discussed in this article is not simple, but a solution of the problems mentioned must be worked out by each farmer on his own property, both because of initial differences in the phosphate content of the soil and differences in soil fertility due to variation in farming practice. The individuality of the New Zealand farmer is often quoted as one of his main attributes. In deciding what is the best manuring programme for a particular farm there is ample scope for exercising individual judgment.

* * *

Germination of Government-approved Seeds

GOVERNMENT-APPROVED seeds, though produced under the supervision and bearing the official endorsement of the Department of Agriculture, do not carry on the container a reference to the official purity and germination certificate covering the seed. Blending of seed is undertaken, however, to ensure that all seed of a variety is uniform in quality for the season, and the following are the germinations of the various lots of Government-approved seed being distributed for sowing in the spring of 1949:—

SWEDE SEED:

Grandmaster Crimson King Resistant Calder	All 90 per cent. or better
Superlative	83 per cent.
Sensation	74 per cent.

YELLOW-FLESHED TURNIP SEED:

Green Top Yellow Soft Green Top Yellow Green Resistant Purple Top Yellow	All 90 per cent. or better
Purple Resistant	86 per cent.

WHITE-FLESHED TURNIP SEED:

Green Globe Purple Globe Red Globe	All 90 per cent. or better

THOUSAND-HEADED KALE SEED:	Over 90 per cent.

All lines except Sensation swede seed show good germination. The germination of the Sensation swede seed, though lower than the others, is sufficient to give a satisfactory strike under normal conditions. If conditions at time of sowing are unsatisfactory, however, a slightly-increased sowing rate may be desirable.

* * *

Selection and Management of the Boar

THE inherited qualities of growth and type place a definite limitation on what can be achieved by feeding and management in the profitable production of porkers and baconers. As the boar contributes half of the inherited make-up of all the pigs to be fattened and therefore has the widest influence over the type of fat pigs turned off, the importance of care in his selection is obvious. Proper management of the boar can influence litter results and prolong his useful life, and in this article A. Longwill, Superintendent of the Pig Industry, Department of Agriculture, Wellington, deals with the regular care and management necessary if the boar is to fulfill his importtant function in the breeding herd.

The production of uniformly high quality porkers and baconers can be achieved best by the use of the Large White sire.

THOUGH on an average under New Zealand conditions boars sire about 200 piglets, a boar may well sire up to 1000 pigs in his lifetime, and as each pig depends on the boar for half of its inherited characters, including type, growth-rate, and efficiency of food conversion, the need for care in the selection of the herd sire cannot be stressed too strongly. This applies to the producer who is breeding for the weaner market as well as to the fattener. The farmer who purchases weaners or stores will gladly pay a premium for the right type of pigs which he knows grow quickly and at the same time produce a high-quality carcass.

Generally, however, home-bred pigs are the most satisfactory and the producer who breeds and fattens all his own pigs sees most clearly the value of a well-bred sire. Some boars leave progeny which, though being rapid growers, do not produce desirable carcasses; others leave progeny which have good carcass quality, but are too slow and expensive to grow. It certainly pays to "breed your own" if the right boar which combines the most desirable qualities can be found.

Use of Crossbred Sows

Unfortunately, some pig producers, either through carelessness or working on the principle that crossbreeding tends to give quick-growing pigs, have ended up with mongrel pigs which do not produce the best growth-rate and certainly have very indifferent carcass quality. Though the use of crossbred sows can be justified for the commercial producer, it is probably best not to go beyond the first cross. There is some evidence that the first-cross sow mated to a boar of a third breed is the basis of a satisfactory breeding system. How successful it will be must, of course, depend largely on the inherited make-up of the purebreds which have been mated to produce the commercial pigs and, most particularly, the inherent qualities of the boar.

As uniformly high carcass quality under competitive conditions is the soundest safeguard for the market for pig meats, it is desirable that the boar should be from a strain which has been proved by carcass tests to have the desirable carcass quality characters. Such qualities can be properly judged only when a reasonable rate of growth, say, .70lb. carcass gain per day, has been achieved and this point must be carefully watched in selection. Carcass competitions which take no heed of growth-rate are of little value in helping with the selection of the best strains. The carcass quality scheme operated by the Department of Agriculture in conjunction with district pig councils and the trade is designed to assist in this direction and much greater use should be made of it.

Breeding Principles and Selection

The pedigree breeder has undertaken a serious task and one which places upon him a real responsibility to the industry as a whole. The breed society lays down standards which contain about 50 points of varying significance. These standards of excellence refer only to points which can be seen and assessed on the live pig, and, taking the utility point of view—that pigs are bred to produce meat of the best quality as economically as possible—one is forced to the conclusion that adherence to these standards exclusively would mean the failure of the pure breeds to assist in improving the efficiency of pigs generally as producers of meat.

Systems of measuring performances have played a large part in improving many breeds of domestic livestock in recent years. These are available in the form of litter recording and carcass evaluation, coupled with growth-rate recording, for pigs, and until these means are used generally by pedigree breeders selection for improved performance characters is severely limited.

In selecting for the large number of desirable points sought in pedigree pigs the progress that can be made in any particular aspect is very small. By concentrating selection on the major points of efficient production and relegating to the background minor "fancy" points rapid progress could still be made.

Commercial Breeding Plan

It is a proven fact that improvement in any particular factor is greatly speeded up by eliminating selection for a multiplicity of other factors. It appears therefore that a national breeding plan based on the improvement of individual breeds for specific purposes to play a predetermined part in the plan would give a more rapid improvement in economy of commercial production than anything else.

Two breeds might be selected as the parent breeds of the commercial first-cross sow. They would be tested by litter recording for the qualities required in the sow, fecundity, mothering, and milking capacity. The first-cross commercial sow in most cases would have these qualities developed even to a greater extent than the purebred strains from which she was bred.

The ultimate test of the ability of a boar to sire good sows lies in the litter records of a fair sample of his daughters. Selection of boars in these breeds must be based on this principle, which is precisely that underlying the merit sire scheme in the breeding of dairy cattle.

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Closing date for receipt of entries is 1st October (late fee entries by 12th October).

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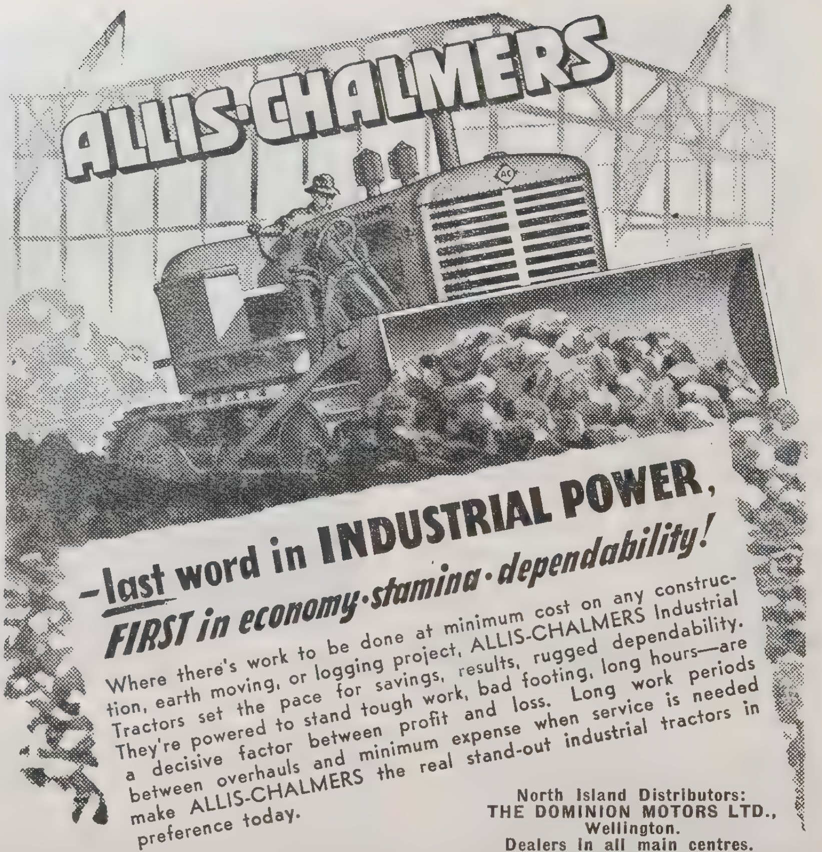

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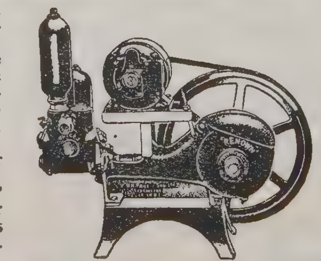

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A third breed, selected as the "sire breed" for all commercial stock, would be selected for carcass quality and economy of gain under testing-station conditions. The already-high standard available in the Large White breed, particularly in carcass quality, points to this breed as the most suitable as the sire breed. The fact that all pigs would be white skinned, forming a more uniform line and making them equally suitable as porkers or baconers, is a further argument in its favour. But selection would require to be made for resistance to sunburn and for economy of gain as well as carcass quality.

The test of the ability of a boar to transmit desirable carcass quality characters lies in full carcass evaluation of a representative sample of his progeny produced under conditions closely similar to those of average commercial practice, together with consideration of rate of growth and economy of gain.

When breeders decide to apply these tests and commercial producers are prepared to pay for the boar with a real pedigree of performance further improvement in the efficiency of performance of the pig stock of this country will be possible. The soundness of the industry as a whole must benefit by the improvement of quality achieved.

Selecting Boar for Commercial Herd

Though the commercial producer should base his selection of a boar on information along the lines indicated above, it is obvious that at present more primitive and less satisfactory means of selection will have to suffice. He should see as many as possible of the stock bred from the same parents as the boar under offer—pigs from the same sire by different sows and also, if possible, pigs from previous litters of the same sow. The ability of parents to transmit the qualities desired in the sow, prolificacy, mothering, and milking ability, can be assessed if daughters have had litters.

If no carcass grading or carcass quality scheme measurement records are available, the selection for carcass quality will have to be judged by eye.

A well-balanced Large White boar. Testing progeny for carcass quality and efficiency of food conversion is the soundest guide in the selection of a boar.

Again, the over-all assessment of the strain of stock will be much more valuable than basing judgment on the single animal. The judgment of a reasonable number of similarly-bred pigs at about the baconer stage at 6 months of age will provide the best basis under these conditions. However, the person making the selection must have a sound idea of the indications of length and other essential quality characters as well as of sound constitution.

It is not sufficient to purchase a pedigree boar simply because it is a registered animal or bred from registered parents. Without the backing of progeny tests at each stage in the pedigree the paper pedigree is of limited value.

Development of the Boar

Any young boar which shows any definite weaknesses while on the sow should be castrated as early as possible, and a close watch should be kept throughout development and further culling carried out as necessary.

A young Berkshire boar. The eye appraisal selection can best be made at about 6 months of age, when the boar should show the characteristics required in the commercial baconer.

Though the young boar should always be well fed, he should never be forced to produce too much weight at an early age. Adequate protein-rich food for body building, with ample exercise and grazing, should be allowed throughout the growing stage. At 4 months, if not earlier, the litter should be divided, the young boars thereafter being kept in a pen to themselves.

If feeding and management have been satisfactory, the boar should reach 200lb. liveweight in 6 months. At this stage occurs the best opportunity to select a boar for future use; checking up on this preliminary selection must, however, await the progeny test.

Soon after this stage a young boar may be used for an occasional service, but, unless he is well grown, it is best to restrict such services very severely until he is 8 or 9 months old. Even then services should be restricted to one per day and not more than one sow (two services) in a week. The sow should not be allowed to run with the boar during the heat period. If one boar only is kept, it is worth while having one or two in-pig sows running with him for company.

In bigger piggeries it is satisfactory to run two or more boars together, provided the practice is regularly followed and the boars are detusked. Under these conditions a service pen out of sight of the boar paddock is required. It is wise when putting a new boar in with others already in the boar paddock to oil all boars before mixing, to see that tusks are rendered harmless, and then to watch to see that the new boar is not knocked about by the others.

Feeding

Where skimmed milk is the basic food ample protein will be available, but a little cereal meal supplement at the rate of 1lb. to 5 or 6 gallons of milk is warranted even at present high meal prices of £20 to £22 per ton

MANAGEMENT OF THE BOAR . . .

for barley meal in the main pig-producing districts. Five small feeds a day for young pigs are desirable on bulky dairy by-products to get optimum growth and yet avoid a pot-bellied appearance.

This applies with even greater force to whey feeding. Whey must be supplemented with meat meal at the rate of ½lb. per pig per day to secure optimum body growth. The animal being reared for breeding purposes will benefit from a slightly-higher rate of protein feeding than this and when sufficient meat meal is available it can be allowed 1lb. per day from 6 months of age until maturity.

During this later stage a greater proportion of the total food required can be obtained from grazing. At a year old a boar can obtain about half the food required from grass if this is of a highly-nutritious character. Hand feeding at this stage should comprise 3 gallons of skimmed milk and 1lb. of cereal meal or 5 gallons of whey and 1lb. of meat meal. When grazing is deficient the ration must be built up with home-grown crops or bought meals on a food unit basis, and consideration given, particularly in winter, when the milk proteins are not available, to the necessity to keep up the protein level of feeding by means of meat meal, pea meal, or other satisfactory protein-rich feeds.

A good guide to feeding is to aim at giving by hand 1 food unit per 100lb. liveweight when good grazing is available and at least double this when no grazing value is being obtained. Home-grown crops, of course, form the cheapest basis of providing the necessary bulk, but with these up to 1lb. of meat meal and cereal meal, according to price and the condition the animal is maintaining, should be used.

When the pig is mature ¾ food unit per 100lb. liveweight, in addition to grazing, should suffice. However, in these recommendations, as in all feeding guides, allowance has to be made for the individuality of the animal. Thus it is left to the art of the feeder to ensure good growth and development, to give full expression to the inherent constitution of the animal, and on the other hand to ensure that feeding is not so forced or unbalanced as to produce overfatness, a pot-bellied appearance, or weakened legs or feet.

Detusking

A surgical operation for removal of the tusks at about 1 year old may be performed, but this is the more expensive, if more permanent, way of detusking, as it requires the administration of an anaesthetic and the services of a veterinarian.

A simpler and quite effective way of detusking is to rope the boar securely to a post and sever the tusks by means of bolt-cutters, a wood chisel used against a block of wood placed through the mouth to form a resistance on the inside edge of the tusk, or a hacksaw.

Where the boar runs with the dry sows it is particularly necessary to detusk, though it is an insurance against accidents at all times. When a boar feeds with sows the sows are frequently ripped by his tusks and occasionally this may have serious consequences with in-pig sows.

Service Management

The act of mating in the pig normally extends over about 10 minutes and no disturbance should be permitted during mating. If more than one boar is kept, the boar required should be taken out into a separate service pen or paddock, and the sow to be mated, after she has been showing signs of heat for 24 hours or so, should be turned in with him and left until it is certain that a satisfactory service has taken place. After a further 24 hours a second service should be given. Where only one boar is kept it is satisfactory, of course, to turn in the sow at the appropriate times to the boar pen. She should be taken out after each service, and if the practice is to run the dry sows with the boar, finally turned out in this paddock only after the heat period has passed.

In general, two services at 24-hour intervals, the first at 24 to 36 hours after the commencement of heat, give the best results measured by fertilisation of the greatest number of eggs. However, if the breeding season is concentrated so that a number of sows require service from the same boar in a limited period, say, more than three sows to be mated to the same boar in a week, it is preferable to limit services to one per sow. This should then be delayed until the sow has been on heat at least 36 hours.

Service Crates

Though they are not commonly used in New Zealand except in breeders' establishments, service crates enable services to be better controlled and permit the use of aged boars on young sows and vice versa.

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DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during July and for the 12 months ended July 31, 1949, with comparative figures for the same month and 12-monthly period of last year, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER—

	Tons				Tons
Period	Creamery	Whey	Total	Percentage inc. or dec.	Total in store at end of mth.
July, 1949	1,494	8	1,502	+35.927	7,220
July, 1948	1,100	5	1,105	—	5,647
Increase or decrease	+394	+3	+397	—	+1,573
For 12 months ended 31/7/49	143,676	2,641	146,317	+11.081	—
For 12 months ended 31/7/48	129,382	2,339	131,721	—	—
Increase or decrease	+14,294	+302	+14,596	—	—

CHEESE—

	Tons				Tons
Period	White	Coloured	Total	Percentage inc. or dec.	Total in store at end of mth.
July, 1949	201	7	208	—11.489	5,457
July, 1948	235	—	235	—	1,421
Increase or decrease	—34	+7	—27	—	+4,036
For 12 months ended 31/7/49	89,639	5,170	94,809	+14.408	—
For 12 months ended 31/7/48	82,869	—	82,869	—	—
Increase or decrease	+6,770	+5,170	+11,940	—	—

If these figures are converted into butterfat equivalent, there is an increase of 11.826 per cent. in butterfat graded for the 12 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

"Commercial Glasshouse Construction in Canterbury"

IN the article "Commercial Glasshouse Construction in Canterbury," which appeared on page 597 of the June issue an error occurred in the tables on page 599, which set out the number of sash bars required for three different-sized glasshouses. In every case the number of sash bars given in the tables is one short of the correct number. The correct figures are set out below.

100ft. x 30ft. Glasshouse

16in. glass: 68 sash bars + 2 end bars = 99ft. 6¼in. long, or 69 sash bars + 2 end bars = 100ft. 11½in. long. 20 sash bars + 2 corner posts = 30ft. 6¼in. wide.

18in. glass: 61 sash bars + 2 end bars = 99ft. 9½in. long, or 62 sash bars + 2 end bars = 101ft. 4¾in. long. 18 sash bars + 2 corner posts = 30ft. 9¾in. wide.

20in. glass: 55 sash bars + 2 end bars = 99ft. 6in. long, or 56 sash bars + 2 end bars = 101ft. 3½in. long. 16 sash bars + 2 corner posts = 30ft. 5¼in. wide.

100ft. x 15ft. Glasshouse

The numbers of sash bars and the lengths of the houses are the same as for 100ft. x 30ft. houses, but the exact widths are:—

16in. glass: 10 sash bars + 2 corner posts = 16ft. 1¼in., or 9 sash bars + 2 corner posts = 14ft. 8½in.

18in. glass: 9 sash bars + 2 corner posts = 16ft. 4½in., or 8 sash bars + 2 corner posts = 14ft. 9¼in.

20in. glass: 8 sash bars + 2 corner posts = 16ft. 3¼in., or 7 sash bars + 2 corner posts = 14ft. 6in.

50ft. x 15ft. Glasshouse

Widths are the same as for 100ft. x 15ft. houses, and the exact lengths and numbers of sash bars required are:—

16in. glass: 34 sash bars + 2 end bars = 50ft. 7¼in.

18in. glass: 30 sash bars + 2 end bars = 50ft. 0¾in.

20in. glass: 27 sash bars + 2 end bars = 49ft. 11in.

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Domestic Beekeeping : Checking Hives and Equipment

DOMESTIC beekeepers should make a detailed examination of their hives during October to check brood, stores, condition of the bees, and equipment. Points which require attention in this work are dealt with in this article by R. Goddard, Apiary Instructor, Department of Agriculture, Tauranga.

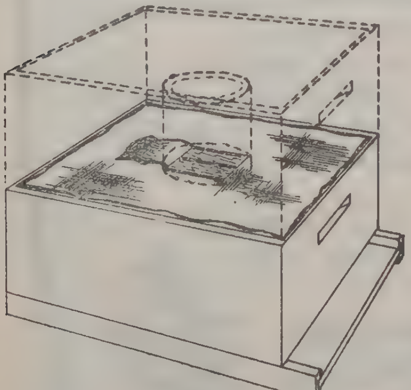
WHEN opening the hive the domestic beekeeper should use the smoker with discretion and not as a weapon to drive and force the bees into submission. Too much smoke, beside tainting the honey in the hive and tending to excite the bees unnecessarily, will make working conditions most unpleasant.

After the bees have been gently smoked the lid should be removed and placed upside down in front of the hive stand. The supers can then be lifted on to it, thus enabling the beekeeper to clean all accumulated debris off the bottom board. In northern parts of New Zealand at this time of the year it is desirable to place all the brood together in the bottom box, with frames containing pollen and honey on the outside walls. During these manipulations all damaged frames, including those containing excessive drone cells, should be replaced with good worker combs.

Patchy brood found during the examination may indicate either the presence of a poor queen or disease in the hive. If disease is suspected, a sample of the brood should be posted immediately to the Apiary Instructor for the district. When the hive is reassembled it is usual for the bottom brood chamber to contain 10 frames, with 9 frames in the second box. Damp and ragged mats should be replaced and all grass clipped around the hive stand.

Stores

It has been estimated that an average colony requires about 25lb. of store honey at this time of the year to meet all future requirements until sufficient nectar is available. The domestic beekeeper must realise that supplies of both pollen and honey diminish rapidly after brood rearing commences. It is therefore essential to keep a close watch on the condition of the hive, and artificial feeding must be resorted to if the colony becomes low in stores.


Position of tin feeder over hole cut in hive mat.

Feeding

Feeding is greatly simplified when the beekeeper has used foresight the previous season and kept back frames of honey which can be placed quickly and quietly in the hive. However, as most amateurs are reluctant to hold even part of their crop in storage, it is necessary to feed a substitute for honey. Sugar syrup (equal parts of lukewarm water and sugar) is generally used, and though this can be fed in many different ways, it is considered that either the division board feeder or a 5lb. honey tin with a press-in lid is the most suitable.

The division board feeder, about the same size as a standard-sized frame, can be made easily from either wood or tinplate. To give the bees some foothold it is necessary to place a wooden float inside the feeder. An empty frame should be removed from the hive and the feeder inserted where it can be filled readily by using a watering can with the spray nozzle removed.

A division board feeder being placed in position.

The domestic beekeeper may find feeding with a 5lb. honey tin the easier of the two methods. A number of small holes are punched in the lid with a frame nail. The tin is then filled with syrup, the lid replaced, and the tin inverted directly over the brood nest. An empty super is then placed on the hive before the lid is put on. If no hive mat is available, sacking may be placed on top of the frames around the tin to preserve colony warmth.

To prevent unnecessary robbing extreme care should be taken to ensure that no syrup is spilt, the bees are not given more than they can take up in a night, and that all feeding operations are carried out in the evening.

Proper attire enables the beekeeper to handle apiary work with the minimum of discomfort.

Equipment

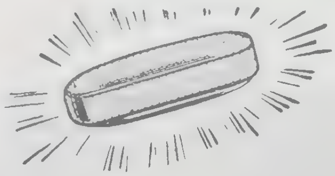
During the shortage of wax many domestic beekeepers resorted to the use of strips of foundation in frames, with the result that the bees built an excessive amount of drone comb and the beekeeper was at a loss to find good worker comb for use in the brood nest. Beekeepers should not try to economise in this important aspect of beekeeping, as it is essential that full sheets of foundation are used at all times.

All equipment should be checked thoroughly during the month and particular attention given to the condition of combs, supers, etc., an ample supply of which should be available for use on the hives as the season progresses.

Rules to Observe

In carrying out apiary work the domestic beekeeper should observe the following rules:—

1. Never open or examine a hive on cold, windy days.
2. During hive manipulation do not disturb the bees unnecessarily.
3. Know what you are doing and do it gently and efficiently with the greatest possible speed.
4. Always be properly attired for apiary work.



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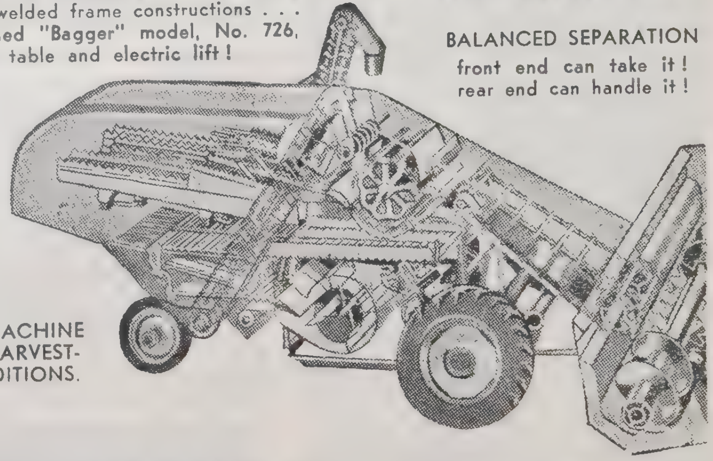

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Short-rotation Ryegrass in Southland

SHORT-ROTATION ryegrass is not grown extensively in Southland, though it has characteristics which may prove valuable under Southland conditions. Indeed, if it were grown more widely, short-rotation ryegrass would solve some of the problems which confront the Southland farmer in connection with seasonal grass production. There are other reasons why farmers would be well advised to establish short-rotation ryegrass, the characteristics and value of which are discussed in this article by A. R. Rankin, Fields Instructor, Department of Agriculture, Invercargill.

AFTER sowing, short-rotation ryegrass establishes very quickly and is thus an excellent deterrent to weed growth. Competition from weeds is a very definite danger to any pasture in its early life, but short-rotation ryegrass, because of its quick establishment, is better able to overcome weeds than most other grasses. However, this does not mean that cultivation before sowing can be neglected and that reliance can be placed on short-rotation ryegrass to overcome the weeds; cultivation should be just as thorough as for the sowing of an ordinary pasture.

Unfortunately, clovers can be affected in exactly the same way as weeds and unless care is taken short-rotation ryegrass will also choke out clovers. Grazing with large numbers of sheep for a short period about 6 weeks after sowing will enable the clovers to establish and compete more successfully with the short-rotation ryegrass.

Establishment and Palatability

The rapid establishment of short-rotation ryegrass was shown in a paddock of 12 acres at Otapiri which was sown on December 29, 1944. Two months after sowing carrying capacity was 8 hoggets to the acre and a fortnight later 13 hoggets per acre. The paddock, which provided ample feed all the time, is an excellent example of how well the grass establishes in a short period.

Short-rotation ryegrass is greatly favoured by stock and is much more palatable than perennial ryegrass. It has been found that a proportion of short-rotation ryegrass included with perennial ryegrass in a mixture will raise the palatability of the pasture considerably.

As is only natural, persistency will depend on the conditions under which the grass is grown and the treatment it receives after sowing. Under suitable conditions of fertility and moisture and given proper management it is possible for short-rotation ryegrass to be virtually permanent.

The breeding of short-rotation ryegrass began in 1937 and since then breeding and selection have been directed toward improving the persistency of the grass, yet retaining its other characteristics.

The improvement in persistency was demonstrated in a trial conducted by the Grasslands Division of the Department of Scientific and Industrial Research at Palmerston North in which the original selection of short-rotation ryegrass (which was not released into commerce) was compared with the latest selection available. The pedigree strains of Italian ryegrass and perennial ryegrass together with a poor strain of perennial ryegrass were all planted out in rows as single-spaced plants. The experiment was laid down on July 4, 1946, and the trial area was subsequently grazed periodically with sheep. Survival counts were made on April 29, 1948, and the following figures show the percentage of plants still surviving in each line of ryegrass.

	Per cent.
Poor perennial ryegrass	9
Pedigree strain Italian ryegrass ..	19
Original selection of short-rotation ryegrass	30
Latest selection of short-rotation ryegrass	75
Pedigree strain perennial ryegrass ..	91

The figures give an excellent comparison between short-rotation and the other ryegrasses; the latest selection of short-rotation ryegrass compares very favourably with them all. Moreover, the marked improvement in the persistency of short-rotation ryegrass is also shown clearly.

The most valuable feature of short-rotation ryegrass as far as the Southland farmer is concerned is its high out-of-season production. It will produce a good bulk of feed in winter and early spring when other grasses are dormant and for this reason alone greater use of short-rotation ryegrass in Southland can be recommended.

An indication of the high winter production of short-rotation ryegrass is shown by the following figures, which give a record of the stock carried on a 12-acre paddock at Otapiri.

Period	Stock carried
June 6-July 24	20 rams
July 25-Aug. 1	200 ewes and 20 rams
Aug. 2-Aug. 16	500 ewes (2 to 3 hours daily)
Aug. 17-Aug. 30	500 ewes (continuous grazing)
Aug. 31-Sept. 15	Spelled
Sept. 16-Sept. 20	140 ewes
Sept. 21-Sept. 22	80 ewes
Sept. 23-Oct. 9	100 ewes

The carrying capacity for June, July, and August must be classed as remarkable—it illustrates the potentiality of short-rotation ryegrass for high out-of-season production, the value of which cannot be over-stressed.

One of the greatest difficulties confronting the Southland farmer is the provision of grass feed during the winter and early spring months. September and October, in particular, are critical months and at this period feed is very short—swedes are past their best and kale and chou moellier, even if sown late, have reached the flowering stage. Short-rotation ryegrass will definitely assist in overcoming this shortage of feed.

Moreover, the fact that the Southland farmer is forced to put his faith completely in supplementary feed for such a long period undoubtedly leads to stock troubles. A recognised method of reducing such troubles is by providing greenfeed and here again short-rotation ryegrass would prove invaluable.

For many years both perennial ryegrass and Italian ryegrass have been used extensively in New Zealand pastures. On high- and medium-fertility country perennial ryegrass is the main component of permanent pasture mixtures, while Italian ryegrass holds a similar position in temporary mixtures. These two ryegrass species, though closely related botanically, differ widely in their characteristics. True perennial ryegrass, for instance, is a long-lived species, while Italian ryegrass is classed as an annual. Italian ryegrass establishes more rapidly than perennial ryegrass, produces a greater bulk of feed in winter and early spring, and is more palatable to stock.

It was felt that a ryegrass species combining as far as possible the best features of both perennial ryegrass and Italian ryegrass would fill a definite place in New Zealand grassland farming, particularly in districts where a system of short-rotation grassland farming was practised.

Vigorous sward of short-rotation ryegrass and white clover.

In 1937 a start was made to raise such a species by the hybridisation of perennial and Italian ryegrass, which are completely inter-fertile and cross readily in the field. The initial resulting hybrids vary greatly in their characteristics, which means that a great deal of selection work is necessary in order to isolate the type of plant desired.

Plants showing the best combination of the desirable features of Italian ryegrass and of perennial ryegrass were selected from these hybrids. From these plants were selected those which were best able to pass on the desirable characteristics to their progeny, thus ensuring that the type finally selected would be retained through several generations of multiplication. As the work of breeding has progressed, so a general improvement in the type of short-rotation ryegrass plant has been achieved.

Suitable Country for Short-rotation Ryegrass

Short-rotation ryegrass demands high fertility and will do well on good ryegrass-white clover country; it does not like wet, waterlogged soils or low-fertility country which will support only browntop, sweet vernal, Yorkshire fog, and other low-fertility-demanding species. Availability of nitrogen is also an important factor, as short-rotation ryegrass is a heavy nitrogen demander and on soils deficient in nitrogen it will have a very unthrifty appearance. Even where nitrogen is plentiful at the time of sowing and is not replaced it will be depleted quickly because of the rapid establishment and high initial production of the short-rotation ryegrass. Thus on country suitable for the growing of short-rotation ryegrass it is not uncommon to see the same yellow, unthrifty appearance in the early life of the pasture as is produced when the grass is grown on the unsuitable nitrogen-deficient soils.

On a short-rotation ryegrass paddock at Winton which was showing signs of nitrogen deficiency as a result of the demands made by the ryegrass 2 plots were topdressed with 1cwt. of sulphate of ammonia per acre and within a fortnight the ryegrass had shown a definite improvement.

Pasture Mixtures

To the Southland farmer short-rotation ryegrass is valuable mainly for the grazing it provides. Seed production and haymaking tend to weaken pastures, and for Southland conditions short-rotation ryegrass offers more advantages when sown for grazing. It can be used for grazing in two ways: As a straight-out, special-purpose pasture, or as a component of a permanent pasture mixture.

The addition of a few pounds of short-rotation ryegrass seed to a mixture will have a very beneficial effect on the palatability and production of a pasture in the first year or two. Beside this, its competition with weed growth will be valuable, and though the short-rotation ryegrass may die out after 2 years, the benefits obtained definitely warrant its inclusion.

On good white clover country the following seed mixture is suitable:—

	lb. per acre
Certified short-rotation ryegrass	15
Certified perennial ryegrass ..	20
Certified white clover	2
Certified Montgomery red clover	2

This mixture can be modified to suit particular requirements and areas where the soil fertility is not as high as on good white clover country and the total quantity of ryegrass can be reduced and species such as cocksfoot and crested dogstail included.

In Southland the fullest benefit is obtained from short-rotation ryegrass where it is used for special-purpose pasture. However, it would be unwise to sow this type of pasture on any but high-fertility country.

Clovers are of great importance in a short-rotation ryegrass pasture, as it is by means of clovers that the ryegrass obtains its nitrogen. On high-fertility areas which are depleted of nitrogen in the early stages, due to the rapid growth and high initial production of short-rotation ryegrass, the nitrogen balance can be restored if clover content and establishment are good.

A seed mixture suitable for sowing as a special-purpose pasture is as follows:—

	lb. per acre
Certified short-rotation ryegrass	30
Certified white clover	1
Certified Montgomery red clover	2
Certified cowgrass	2

Establishment

The seed-bed should be well compacted from the bottom to near the surface, with a shallow tilth at the surface to enable the seed to be properly covered. Unless conditions are unusually favourable, seed will not germinate in a seed-bed that is at all cloddy; particularly is this the case with clover seed, which has a hard protective coat through which moisture will not readily penetrate. A cloddy seed-bed leaves open spaces below the surface, which prevent moisture from rising to the seed and germinating it. It is for this reason that it is not unusual to see a good strike of grass and a poor strike of clover. The need for strong clover growth has already been stressed, but this cannot be obtained unless the condition of the seed-bed allows good clover establishment.

All deep working should be completed in time to allow for a fallow of 6 to 8 weeks before sowing. During this fallow the area should be given only light cultivation which is sufficient to reduce loss of moisture and eradicate weed seedlings; the soil is also compacted from the bottom upward and weathering and aeration assisted, with a consequent increase in soil fertility. The final firming of the seed-bed is achieved by further use of the harrows and one or two rollings. A firm rolled surface is best for sowing seed on and sowing should be followed by a light stroke with the harrows.

The pasture can be sown in November, December, January, or February, but if sowings are too late, clover establishment may be adversely affected. One ton of lime per acre should be applied before sowing and 1 to 2cwt. of superphosphate sown with the seed.

Maintenance

An annual topdressing of 2cwt. of superphosphate and 5cwt. of lime per acre will maintain a vigorous growth of clover, which in turn will maintain the short-rotation ryegrass. Grazing management also plays an important part and incorrect grazing will reduce greatly the life of the pasture. Six to 8 weeks after sowing, the pasture should be grazed to encourage tillering and to prevent clovers from being smothered. It is best to graze with a concentration of 20 to 30 sheep per acre for 3 to 4 days—over-grazing before young plants are well rooted is harmful and poaching must also be avoided. Care must be taken also with subsequent grazing, as short-rotation ryegrass does best when it is leniently and rotationally grazed.

In a trial conducted at Palmerston North by the Grasslands Division of the Department of Scientific and Industrial Research a comparison was made on the effect of grazing on perennial ryegrass and short-rotation ryegrass. Three paddocks were sown with a complete mixture, including 15lb. of short-rotation ryegrass and 20lb. of perennial ryegrass. Each of these paddocks received different grazing treatments. The first was grazed continuously, the second rotationally, and the third was grazed rotationally with long spells between grazing. Eight months later turves were removed from each paddock. These were analysed and the percentage of each pasture species present was calculated, the results being as follows:—

Species	Continuous grazing (per cent.)	Rotational grazing (per cent.)	Rotational grazing with long spells (per cent.)
Short-rotation ryegrass ..	3	21	40
Perennial ryegrass ..	43	40	30
Other grasses	8	12	trace
White clover ..	42	24	23
Red clover ..	3	2	5
Other species ..	1	1	2

From these figures it can be seen that under hard grazing short-rotation ryegrass was virtually eliminated. However, where grazing management suited the short-rotation ryegrass it was very much in evidence. It must be remembered that the trial was not conducted under Southland conditions; however, it gives a general idea of the effect of grazing management on short-rotation ryegrass.

The main production from short-rotation ryegrass is in late autumn, spring, and early summer, but in late summer and autumn production is low. At this period, however, clovers, particularly red clover, are growing vigorously. The pasture mixtures recommended earlier are excellent combinations for maintaining growth throughout spring, summer, and autumn. It must be recognised that the pasture is not permanent, but is designed to give high out-of-season production for about 3 years or longer.

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Household Poultry: Feeding Chicks—Proteins and Vitamins—Grits and Greenfeed

POULTRY strains have been evolved over a very long period and, through natural selection, they have developed a digestive system which best suits the foodstuffs they would find in open-range conditions. While bodily development can be improved and mortality decreased, the workings of the digestive tract cannot be altered much. Bulkiness in the ration gives a feeling of fullness in the digestive organs and deters the birds from overeating. It also seems to distend the intestinal tract and keep it in better condition to resist disease and internal parasites. In theory it should be possible to produce concentrated rations suitable for poultry, but in practice better results are gained from the bulky diet that fowls obtain in natural conditions. In this month's article for the household poultry keeper W. L. McIver, Poultry Instructor, Department of Agriculture, Dunedin, gives advice on the feeding of chickens.

[Photo News Ltd. photo.

Chicks being fed from troughs of a suitable type. In the right background is a convenient type of drinker for chicks.

POULTRY differ fundamentally from most other forms of livestock in several respects. Under natural conditions chickens eat both vegetable and animal matter, making them omnivorous. As they are adapted to this type of feeding, it is not surprising that under domesticated conditions poultry do not give satisfactory egg production if fed rations composed entirely of vegetable material. Favourable results can be expected from the addition of some minerals and vitamins. With the improved commercial egg-laying strains special attention to food materials is necessary to obtain this increased yield. With other livestock improved growth and development are the main concern, but with hens egg production is solely the result of reproductive action.

The digestive organs of birds are comparatively small, and the fact that they have no teeth has considerable bearing on feeding methods. Another factor is that poultry are fed in flocks and not as individuals. Consequently the feed must be palatable, foodstuffs must be supplied in a proper ratio, to some extent bulk must be maintained, the feed must be given in the correct form, and it must be economical.

Too high a proportion of heat- and fat-producing foods will affect body condition and even egg production, and excess protein will injure health and over-stimulate the ovary. Formulas have been worked out to serve as guides for the mixing of mash rations and the feeding of grains. Details of these and further advice can be obtained by poultry keepers who desire more complete information than is given in this article from bulletin No. 199 "Chick Raising", which is available for 6d. from offices of the Department of Agriculture.

Feeding Chicks

Young chicks are not fitted to eat coarse foods, so easily-digested feed should be given at first. To ensure that they obtain proper quantities they should be fed often; feeding five times a day is advisable at the start, and it may be gradually reduced to thrice daily.

Regular and even growth of the chicks should be the aim of the poultry keeper, and that is possible only if they can obtain steady and proper quantities of the correct foods. For the first 4 days chicks should be fed with fine (No. 1) chick grain. On the fifth day the number of grain feeds should be reduced to three and two feeds of dry chick mash and a morning and afternoon feed of finely-chopped greenfeed added. This programme may be continued until the fifth week, when wet mash is given in place of one of the dry-mash feeds. After the third week coarser (No 2) chick grain is more suitable.

Many commercial chick rearers prefer their own recipes for mashes, but no good purpose would be served by quoting different ones while bran and pollard are in short supply. Standard chick mashes, Nos. 1 and 2, are readily available, as are standard laying mashes.

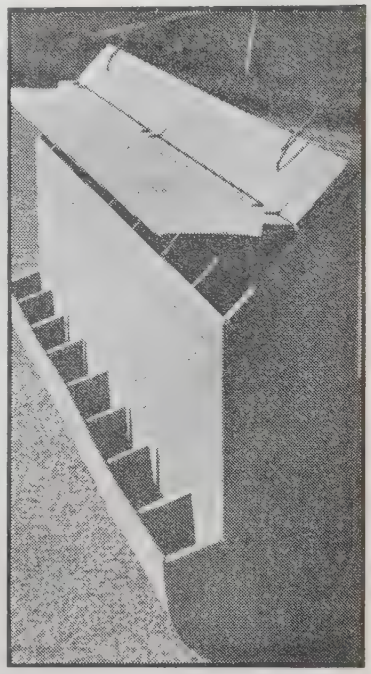
Proteins

Animal foodstuffs are important to chicks and must be supplied in some satisfactory form. In theory the ideal animal feed for young chicks would be worms, but though an abundance of worms might cause the chicks to grow better, there is grave danger of their carrying poultry diseases if they come from tainted soil. For young chicks cooked eggs are a satisfactory substitute, and cod-liver oil at the rate of ½ to 1 per cent. of the ration by weight should be used if they do not get a normal amount of direct sunshine or sufficient greenfeed.

Milk is another very satisfactory growing feed and dried-milk powder is a good substitute. Many chick rearers consider that a milk "flush" is a cure for coccidiosis, but it is not. Milk is valuable as a food because of its favourable influence on growth and stamina; that, of course, contributes to giving the chick better resistance to coccidiosis and other diseases. The milk may be fed either fresh or sour and, as the bird's digestive system is not meant to cope with much fat, it is better skimmed. Even though milk is fed, clean water should be available for the chicks at all times.

When hatched, chicks are weak, helpless creatures unable to range in search of their own feed. Nature has made provision for nourishing the chick until it can move about. Just before the chick is hatched, the egg yolk is taken into its body to provide food for 2 or 3 days. This natural start and the fact that a chick on free range would obtain mainly protein foods, with some sprouted seeds and grass tips, tend to show that the artificially-reared chick should not be started off on too much cereal products. In addition, young chicks depend largely on the mother hen for warmth and at the start do not need a large proportion of fats and carbohydrates, the heat- and energy-producing elements. Experiments have shown that chicks fed as soon as they are fluffed up after hatching suffer no adverse effects, but that early feeding gives no advantage over the usual practice of witholding feed for two days. The chicks should be fed when they are about 48 hours old. A favourite chick starter consists of hard-boiled eggs chopped up and mixed with rolled oats.

The amount of animal product required by growing pullets depends on the natural feed picked up on range. Too much of this type of feed will force maturity and prevent satisfactory development, but a protein deficiency is just as detrimental. Too much meat, raw or cooked, must not be used, as it is difficult for the birds to digest, apart from being uneconomical. Fish scraps are excellent, but too much must not be fed or the eggs of laying birds may be tainted. Though manufactured meat meals vary greatly in their composition and food value, feeding a good grade of meal is the best way of providing proteins for poultry. Blood meal and blood-and-bone meal contain high protein ratios, but are not very palatable to poultry.



A wooden dry-mash hopper. The number of divisions need not be as large as shown, but compartments at either end may be used for hard and soft grit.

Vitamins

The mathematical method of balancing the diet by working out the nutritive ratio does not take into consideration the requirements of minerals or of the so-called vitamins that have been given prominence in nutrition recommendations during the past few years. Vitamins are food constituents not well understood, but experiments have shown their presence and the effects of many of them.

Vitamins are known to have a considerable influence on the health and productive capacity of the fowl. Most of the vitamins required by poultry need cause no special concern, as the usual varied diet supplies all necessary for adult birds, provided they get sufficient greenfeed and direct sunshine. The vitamins which seriously concern the chick rearer are A and D. The first occurs in butter, whole milk, fresh cod-liver oil, leafy greens, and yellow maize and the second in cod-liver oil and the yolk of fresh eggs. If young chicks do not get enough sunshine during bad weather, 1 or 2 per cent. of a fish oil should be fed in the mash.

Grits

Poultry require two different types of grit. The first is hard grit in the form of stones, the desirable kind being small, angular, sharp pieces; road-metal screenings are better than rounded river or beach stones. The other type is soft mineral grit, such as oyster shell or limestone. Though the feeding of soft grit to growing pullets is desirable, experiments tend to show that its inclusion in the ration does not materially change the rate of growth of birds up to 6 months. However, it does have a beneficial effect on the gizzard action and aids bone development.

A producing pullet or hen must have sufficient mineral rations if soft-shelled eggs are to be kept to a minimum.

Simple hoppers for supplying both types of grit can be readily constructed. The one illustrated on this page is useful for holding a variety of foodstuffs and permits the birds to balance their own diet if mash, grains, meat meal, and grits are placed in the compartments.

Greenfeed

An abundance of greenfeed is necessary for best results in chicks and growing pullets. It furnishes vitamin A and provides a bulk that keeps the digestive system in proper order. If adequate greenfeed is not obtainable on the range area, the birds should be supplied with freshly-cut greens. Lawn cuttings are good only when the grass is short and luscious. Among greens that may be used are clover, chickweed, watercress, silver beet, cabbage, lettuce, chou moellier, lucerne, carrots, and growing oats, barley, or maize. Too much rape is not desirable for laying pullets, as it can discolour the yolk seriously. The greens are best when freshly cut in lengths of about ½in., especially when they tend to be fibrous.

The poultry keeper is well advised to plan ahead for greens by preparing a planting schedule of types that grow best in the locality; this will ensure a succession of quality feed.

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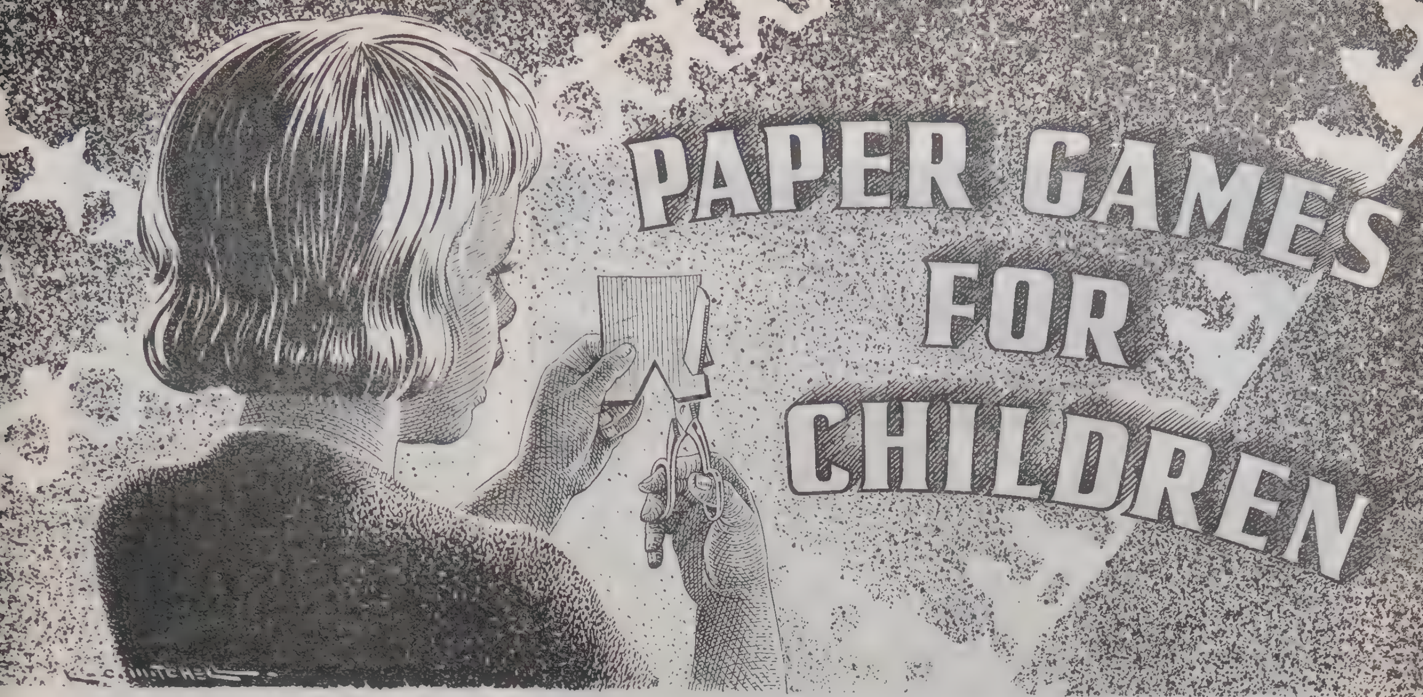
METEOROLOGICAL RECORDS FOR JULY

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	52.6	+ 2.6	66.0	34.0	1.69	12		0.45	2	118.6
Auckland	160	53.4	+ 1.9	66.0	36.0	3.81	23	— 1.87	0.56	21	107.4
Tauranga	10	50.8	+ 2.4	65.5	29.8	2.06	18	— 3.00	0.32	31	140.9
Ruakura	131	49.4	+ 2.6	63.7	23.8	4.86	26	+ 0.02	0.53	27	84.5
Rotorua	980	47.7	+ 3.1	64.0	27.0	3.64	19	— 1.34	0.75	27	104.2
Gisborne	12	50.9	+ 3.3	69.0	30.7	0.75	7	— 3.58	0.20	28	154.4
New Plymouth ..	160	51.2	+ 2.6	60.2	35.4	7.38	24	+ 1.06	1.31	28	106.5
Napier	5	50.9	+ 4.1	69.9	30.3	1.35	8	— 2.20	0.38	28	152.1
Taihape	2157	44.5	+ 3.1	61.0	30.9	4.52	23	+ 1.45	0.68	28	
Wanganui	72	51.2	+ 4.4	67.7	35.2	5.48	23	+ 2.22	1.04	28	88.3
Palmerston North	110	49.0	+ 3.5	64.9	29.0	5.59	23	+ 2.48	0.75	28	71.5
Waingawa	350	47.4	+ 3.3	67.0	26.5	3.89	16	— 0.23	0.79	28	133.0
Wellington	415	49.4	+ 3.1	59.8	36.1	5.61	16	+ 0.52	0.95	2	110.0
Nelson	24	48.0	+ 2.7	62.6	32.8	2.18	13	— 1.25	0.96	27	154.5
Blenheim	12	48.5	+ 4.6	64.0	30.2	2.17	13	— 0.56	0.39	27	156.8
Hokitika	12	46.4	+ 2.7	57.0	32.0	12.81	25	+ 4.10	2.07	27	74.1
Hanmer Springs ..	1225	42.9	+ 4.8	66.6	21.0	4.91	14	+ 0.65	1.01	28	120.6
Christchurch ..	22	45.1	+ 2.9	67.0	27.0	2.02	13	— 0.64	0.47	28	134.5
Ashburton	323	44.0	+ 3.9	69.6	25.2	3.07	13	+ 0.42	0.83	10	116.2
Timaru	56	44.0	+ 2.7	66.8	27.8	1.20	11	— 0.53	0.31	10	143.9
Alexandra	520	41.4	+ 5.5	61.9	23.2	1.33	13	+ 0.68	0.33	27	109.0
Taieri	80	43.3	+ 2.3	67.7	25.4	2.78	18	+ 0.65	1.30	27	
Invercargill ..	32	43.5	+ 2.8	62.0	27.0	4.40	22	+ 1.40	1.05	10	79.1



PAPER GAMES FOR CHILDREN

THE play of children can be guided in many ways toward the development of their creative instincts and the extension of their curiosity to the desire for knowledge of the wide world in which they find themselves. This article and the next two in the series on child care and development by Dorothy Johnson, Rural Sociologist, Department of Agriculture, Christchurch, deal with a selected few of the many possible occupations—those using paper.

GIVEN gardens of their own, while digging in the soil and planting seeds children will develop curiosity to learn how plants grow from seeds and how their food is produced. (Children on farms are fortunate in that they can follow these processes to the adult level by observation of the work going on around them and listening to the daily conversation.) Given the opportunity to play with dough, in later years the girls, at least, will hardly remember when they first learned the art of baking. By playing with blocks they imitate the construction of buildings they have seen, and they can be encouraged to make dolls and toys from common materials that are easily obtained. They become inventors by acquiring the habit of expressing through their hands the thoughts of their minds. Nearly always the playthings thus made have a larger value in the eyes of the children than the more elaborate and expensive toys bought for them. In all these activities the happiness expressed by singing and laughing should be the accompanying feeling tone or emotional climate, whether it be "work" or a game. To live with children, to play with them, and to see things from their point of view is a privilege.

Of the many possible occupations those using paper have been chosen partly because of the ready availability in every home of the material required and partly because in their accomplishment they emphasise a "togetherness" between parents and children. Fathers as well as mothers can have the opportunity throughout the precious formative years from babyhood onward to supply the ideas and understanding that spur the eager little questing minds to further efforts and creations of their own. It is hoped, too, that they will give parents ideas for putting into practice that regular, whole-hearted play with their children which by and large is more important to their future than growing up in a background of high material success—that is, if one can be gained only at the expense of the other.

But the child's needs in this respect can be met with a few minutes' attention here and there. It is the awareness, and therefore the readiness to meet them, that is required. Fortunately for the children they are being met everywhere, and those who are doing so perhaps can take pleasure in seeing their ideas or philosophy put into words. To men and women who are just setting out on the great adventure of parenthood, which usually coincides with the hard work required to "get on their feet" from the economic point of view, it is hoped that these suggestions will be helpful to meet immediate needs. Indeed, it is hoped that they will help in keeping some of the perhaps less obvious but more essential values of this human life in the patterns of living they are creating together.

> "Fill the waking hours of your children with beneficial occupations, for to the child the world is a big place and his ideas are bewildered when he is left entirely to himself. The directions you will thus be enabled to give to the children's play will in a large measure determine the ideals that are to influence their later lives, at the same time helping them to meet their problems and to tackle their work with confidence and self-reliance."—Maude Nash.

As a material for providing occupation for children nothing is better than paper. It is cheap and plentiful and its uses are many and various. Newspaper, wallpaper, wrapping paper, tissue paper, coloured paper—all kinds can be pressed into service. There is always something fascinating about a piece of paper.

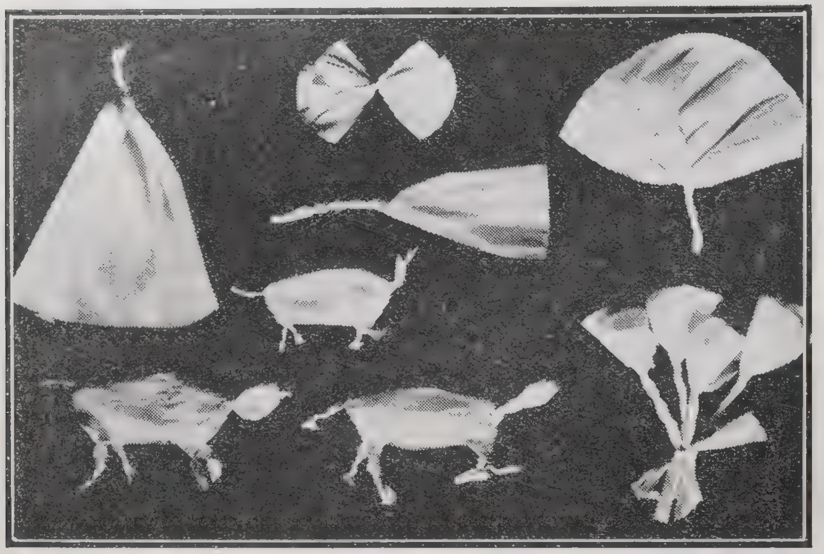
As the child's inquiring and inquisitive nature develops there is a great opportunity for suggestion and creation with this material. Babies love the crackling sounds it makes if they lie on newspaper over a soft blanket for their daily kicking exercises. Here are some of the ways in which paper can be used.

Paper Crumpling

For the child between 2 and 3 years of age there is great fun in making objects with crumpled paper, and crumpling uses the muscles of the whole hand. He should be given it first in that part of the day's play when the mother is with him. Newspapers are plentiful, so he may be allowed as much as he needs, though only half a sheet at a time, as whole sheets are too large for tiny hands to deal with. At first he will be satisfied and delighted just to crush and crumple the paper for the rustling sound it makes. After a while the mother may pause in her mending or knitting and crumple a piece of paper herself, but crumple it into a shape—say, a ball—and toss it to the child with such a remark as "Can Bobby roll the ball?" He may be allowed to play with it while his mother makes another, this time with a piece of darning wool threaded through it so that he can play more easily with it. Play with him for a few moments with the balls. That is enough suggestion for one day. He may or may not imitate his mother by making a ball himself.

Another day make two balls, join them with wool one on top of the other, and there is a "doll," made more convincing if sticks are pushed in for arms and legs and another sheet of paper is wrapped round it for a dress.

PAPER GAMES FOR CHILDREN



[*Green and Hahn Ltd. photo.*

The features may be marked with ink. Gently nurse or rock it a few moments to make it more realistic. Coloured tissue paper extends the possibilities. Make the body of the doll of white paper and use a red piece for the cloak. If this is put over the head like a shawl and tied round the neck with cotton it could be called "Red Riding Hood"—that is, if that story has not been banished from the family as conjuring up fear in a particularly-revolting form. Pieces of coloured paper when crumpled will suggest bulbs, snowballs, rocks, lumps of coal, an orange or lemon, or a cabbage to children.

The next possibility is to make a goat like the doll but with pieces of the crumpled paper pinched up on each side of the head for ears. Provide him with a tail of black tape and eyes cut out of black and green cloth (never buttons, which could be bitten off and swallowed). Even whiskers can be contrived from waxed thread. When the goat is made, pretend to stroke it. Making these temporary playthings is quite fun. They do not last—not even long enough to be photographed to show readers. Distinctly, they are not photogenic, though many other paper objects are, as the illustrations with this article demonstrate.

If parents and big sisters and brothers take the trouble to show the "littlest one" what can be done, he will soon begin to shape some objects himself. The results will probably not be recognisable to anyone but himself, but as was pointed out in the second article of this series, "Building a Child's Personality," his efforts must not be ridiculed in any way. He has begun to use his hands as tools and has started on the great adventure of that side of his life that most distinguishes him from the animals. As the hands develop their power, so does the mind in parallel channels. Even this simple work stimulates the imagination.

Rolling Paper

A firm roll of newspaper can be a walking stick, a rolling pin, or a closed umbrella. Make a small roll, twist a small portion of the end, and there is a candle; the end may be dipped in ink to make a wick. With another roll stick two skewers in for masts and turn up the ends to make a boat.

These are but a few suggestions; the family will think of others, and so will the child. These occupations all provide subjects for pleasant chatter between adults and children, with great benefit to the speech and social development of the children.

Paper Twisting

Whereas in crumpling paper the whole hand is used, in twisting only the fingers are brought into play. Coloured tissue or crepe paper is necessary for this work. It is more advanced, too, as it is really early modelling done in a very simple fashion.

Perhaps it would be best to do it first as an entertainment to a family group. The older ones will pick it up quickly. Various sizes and shapes can be used, but in all the samples illustrated above the cuts are straight, as these are easier for the younger ones. The easiest is a bow, which is a single twist. A butterfly can be made with a double bow in the same or constrasting colours. Then comes a shovel or a flour or sugar scoop; a bottle or a bell; a tent; a fan; a cap, which is a square of paper with a twist at each of the four corners; and some rather unusual farmyard animals.

Paper Tearing

An occupation of endless delight, paper tearing can be pursued to high levels of attainment. It is a favourite competition for grown-up as well as children's parties, followed by a guessing game on everybody's efforts. Carefully watched so that the paper does not go in his mouth, even the baby can have a happy time just tearing; he loves the sound and seeing something happen. Surprisingly-good results can be obtained by a child of 5 or even 4 after some practice.

Newspaper is the best material and about a 12in. square is the best size for small fingers. If a small child is asked to tear the paper into some shape, he is likely to say that he cannot, so it is as well for his mother or big sister to practise tearing paper before the game is introduced to the child. Here are a few hints: Always hold the paper between the thumbs and forefingers of both hands close together, and tear a small piece at a time, enabling finer detail to be achieved; use only the tips of the forefingers and thumbs, the paper being moved round as the tearing proceeds; avoid tearing off small pieces; if possible the part torn off should be in one piece; if the result is not satisfactory, do not tamper with it, but start again with a fresh piece of paper.

Simple objects should be tried first, such as a ball, an apple, a pear, a jug, or a house. Only by practice can success be attained. It seems hopeless at first, but the skill develops quickly later. With a piece of paper folded, tearing double will quickly make some objects. In making a tree, start tearing the trunk and balance each side as nearly as possible as the branches are made. The pig and the horse in the illustration opposite are more advanced work. With the early efforts of small children (and not only small children) much more imagination is required to identify the objects torn than is necessary with these illustrations. It is best to ask the creator to name his work in order to appreciate the effort.

For the illustrations shown white writing paper was used mounted on black carton paper; this is mentioned to suggest ways in which the better efforts can be used to make calendars or bookmarks for gifts. Coloured paper gives good results, too, and it can be bought in a wide variety of shades. It is worth while to sow the seed of the idea that real gifts to others are those made by the giver.

The necessary tidying-up process after a session of paper tearing can be made into a game.

In the next article, on picture making, the pleasing pictures that can be built up with these objects will be shown.

Paper Folding

A mother with half an hour to spare and needing the stimulus of something new should try showing the youngsters how to do simple paper folding. Begin with 8in. squares of newspaper or wallpaper. (They need to be perfect squares, so enlist the help of the older people, including the father, to lay up a stock of paper squares in readiness.) Never lift the paper from the table in the process of folding.

The simplest thing to do is first to fold the right edge to the left, having the corners touch as accurately as possible, then crease firmly with the thumb, starting from the centre, first to one side and then to the other. The first thought is that a book has been made. Let the child make several and pin or sew them together in the middle.

It is his first and very own book. He may write or draw on the pages or paste in the objects that he has torn. At all events, he is very proud of the book he has made.

Fold another piece of paper in the same way, stand it on its edge, and there is a screen; play "Peep-bo" with it. Fold another piece, open it, make the same fold the other way, and there

[Green and Hahn Ltd. photo.

is a four-fold square which is the foundation of many simple objects. It can be a window with four panes of glass. If the second fold is made over the first fold, a table napkin or a handkerchief is made; with a pencil put a small design including the child's initials in the corner. Fold back one corner and a pocket is made. If a tape or cord is threaded through the other three corners, it becomes a wall pocket. It can be repeated in coloured paper and given as a present.

Open out another square after folding it into four, turn the corners into the middle, and there is a scone doily or a handkerchief. In another square make the first fold into two, open it out, and fold each edge to meet in the middle crease; using a little imagination, there is a window with shutters. With a few pencil strokes curtain effects can make the window seem more real. Now turn the window over so that the shutters form legs and it becomes a table.

Already ideas for the next birthday party have been formed. The child can have a share in the festive preparation by folding the paper napkins and doilies for the sandwiches and scones. If the parent is ambitious or has a child really interested, the next step is to make 16 squares. This is done by first folding the paper into four squares and then folding each to the middle (as in making the shuttered window) both vertically and horizontally. All sorts of flat and solid objects are possible from this basis—for example, flat houses with roofs and gables; solid (really three-dimensional) boxes; tables with legs, and chairs, cupboards, and sideboards, especially if stout brown wrapping paper is used. The child will certainly need help when he begins to make furniture, but he will begin to think out objects for himself.

From these suggestions the hand and the imagination may be led on to producing moons, half moons, balls, fans, and tents from circles of paper. This folding is very simple, but it will amuse children from 3 to 7 years of age and prepare their fingers for further work.

Paper Cutting

Some experts prefer paper tearing and cutting to drawing as an occupation for children, because in cutting and tearing the lines cannot be altered or rubbed out. Thus directness and accuracy are fostered in children. Paper cutting is an advance on paper tearing, because the child is using a tool—that is, he is extending the capacity of his fingers.

In the beginning, give him paper and scissors and let him find out what he can do with them. For a pre-school child scissors 4in. long with blunt-pointed blades should be used. At 6 years old, after 2 years of manipulating the smaller ones, he can be given a larger, pointed pair. In every case the scissors should be sharp enough to cut with a clean edge. Start him off with good scissor technique, encouraging him to open the scissors as far as they will go and keep the wide blade downward. A long length should be cut in one movement of the scissors, thus ensuring a clean edge. Newspaper and wallpaper make good practice paper for cutting, just as they do for tearing and folding.

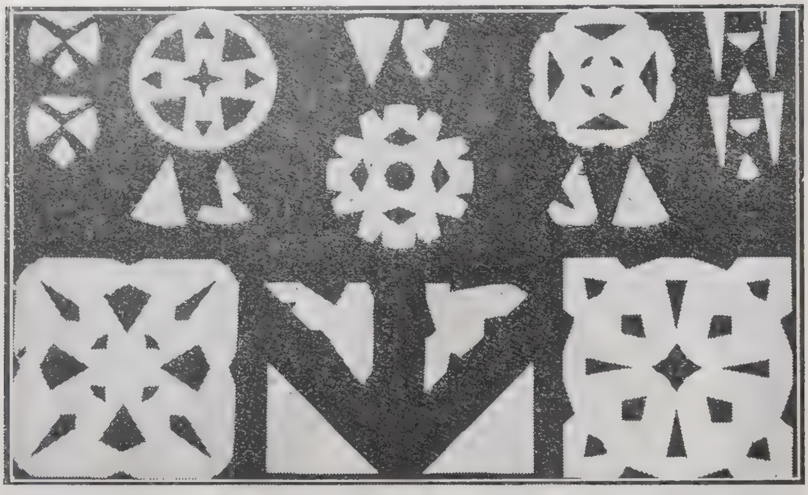
Quite a number of children will find great pleasure in the seemingly-monotonous occupation of cutting out columns of newspaper. This may be followed by the cutting out of pictures from catalogues and magazines, choosing the larger ones. A child's muscles are not ready for small detailed work which cramps his movements. His books made in paper folding can become his scrapbooks filled with pictures of his own choice, either already coloured or coloured by himself with crayons or paint. For this occupation spread newspapers on a veranda table and provide him with a clean rag or blotting paper, a brush, and some starch paste, which leaves less mark than flour paste. Show him how to mount the pictures. The paste should be applied first to the centre and then to the edges of the picture, which must be held firmly. When the picture is well pasted, carefully pick it up with the thumb and forefinger of each hand, place it paste side down in position, and press it lightly with the duster. Pat it well until it sticks, but avoid rubbing.

Let the arrangement of the pictures be his own, for it is his first experience with design.

Folding and Cutting

As is shown in the illustration at the top of the following page, the basis for folding and cutting out doilies and mats is either a square or a circle. The square is folded into four triangles and the circle into four segments, and the pieces to be cut out are marked. The results are shown in both folded and opened-out form. Many variations are possible, giving scope for more work in design—for example, the combination of large and small holes in a great variety of shapes and positions.

Children, and luckily many grown-ups, including fathers and grandfathers, love strip cutting—cutting out a number of figures at the same time. It combines paper folding and paper cutting. Take a strip of paper 2in.



[*Green and Hahn Ltd. photo.*

wide and 16in. long; fold it across the middle widthwise, fold it in half again, making four thicknesses, and repeat until there are 16 thicknesses. Then cut the paper as shown in the illustrations, making a chain, a row of bells, a row of candles in candlesticks, of dolls, little men, pots of flowers, swans, cats, anchors, or teddy bears. The illustrations below show the process quite clearly, though skilled strip cutters do not always draw the design as shown, but cut "out of their heads." Notice the place where there is no cut to ensure continuity of paper—for example, the edge of the pots, the beak of the swans, or the arm of the teddy bears and dolls.

The designs shown vary in complexity. Strip cutting in its more elaborate stages is an art which belongs chiefly, it seems, to fathers and grandfathers, judging from the comments received from many quarters as the work of producing these illustrations proceeded. Reminiscences have poured out, mostly beginning with: "I can remember my dad (or grandad) on many a winter's night amusing us all cutting out strips like that. His invention seemed endless. The floor would be knee-high round him with discarded paper. There were some designs we were always asking him to repeat. We used them for Christmas decorations. It is one of the best and most vivid memories of my childhood."

Has the Art been Lost?

The illustrations shown were made by several adults, including the parents of young families. They may be criticised on the score that they set a standard beyond an ordinary child's achievement. When ideas of what can be done by paper cuts are being given, as in this article, they need to be as closely and as skilfully representational as possible. That is the best way of conveying an idea from one adult mind to another or to a child's mind. The ideas suggested must be clear.

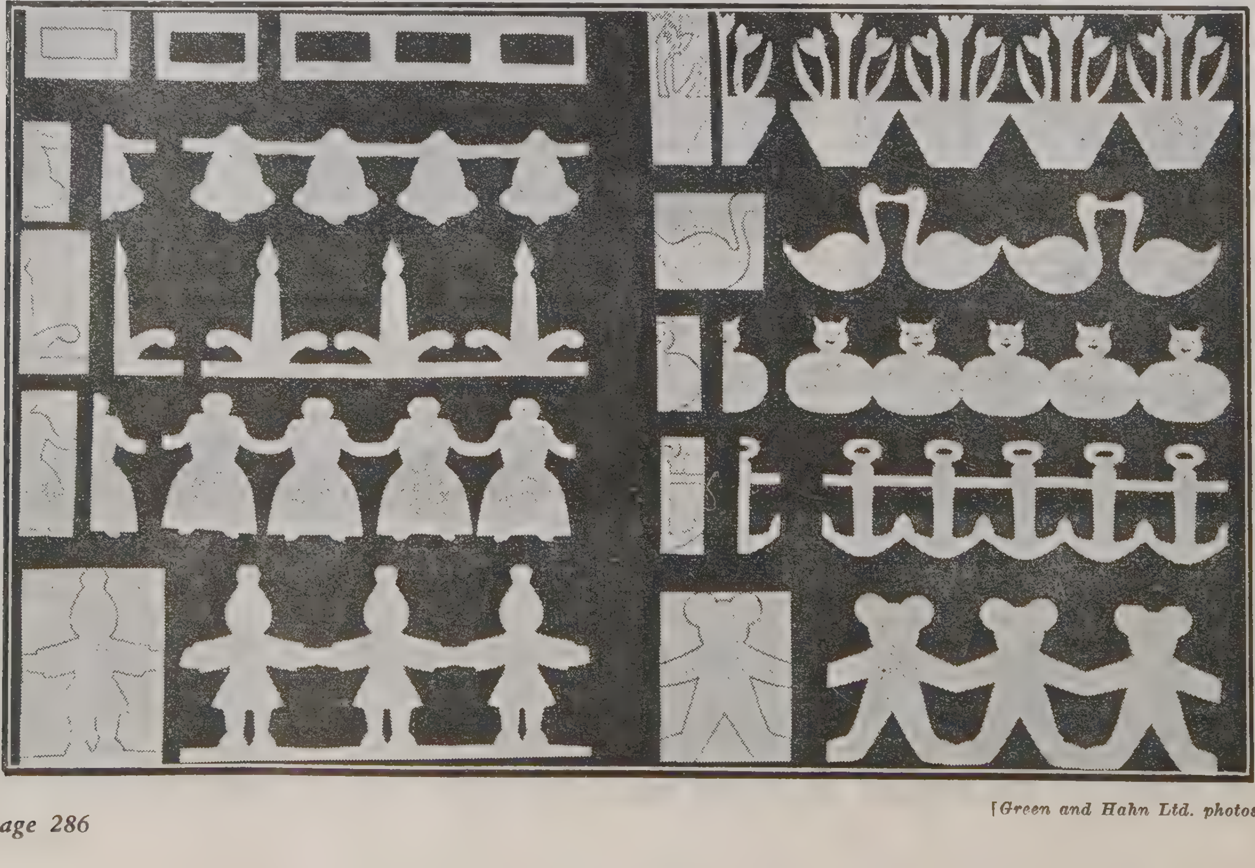
It is not expected that the child will produce something of like standard, at any rate at first, though with practice really skilled work is achieved. As the child already has ideas in his mind of the object he wants to cut or tear, he easily accepts his own results. They and the ideas in his mind match, however different they are from the adults' conception. Here ideas are really being given to the adults, who may or may not show the pictures to the child. It is the parents whose imaginations are to be kindled to develop all those potentialities and recreational skills which will keep them longest able to lead and beckon their children on the many rich avenues of adventure, of creativeness, of fun making, humour, and comradeship.

Acknowledgments

"The Kindergarten Children's Hours," Part 2, by Maude Nash.

"Home Training for Young Children," by H. M. Heaton.

"The Dryad Quarterlies" (England).



[*Green and Hahn Ltd. photos.*

SEWING FASTENINGS ON GARMENTS

HAVING to replace fastenings during the life of a garment is extremely annoying to a woman. Barring accidents, well-sewn-on fastenings usually will last as long as the garment. Fastenings which gape open, edges which turn back to expose hooks or domes, or a row of buttons which should fall at the centre front but does not quite do so are sources of dissatisfaction to the wearer. This article by Edith G. McNab, Rural Sociologist, Department of Agriculture, Dunedin, offers the home dressmaker some advice on the handling of these details.

ALL fastenings—buttons, domes, or hooks—are sewn on doubled or faced material, never on single material. Buttons may be used as fastenings anywhere except where a very flat, inconspicuous closing is desired. Then either domes or hooks and eyes may be chosen, domes being used when no great strength is required (for example, in sleeve plackets) and hooks where the fastening is likely to be subjected to some strain (for example, in side plackets for skirts and dresses).

No matter which kind of fastening is chosen, the spacing must be such that no gaping will occur. It may vary from only an inch or so between fastenings in a placket to several inches apart for the front closing of a coat. Domes and hooks are placed near the edge on the wrong side, but far enough back from it to be invisible from the right side; if they are placed too far from the edge, the edge will be likely to turn back.

The size of the fastenings must be related to the kind of closing desired and the weight of the fabric. For lightweight materials the smaller sizes of domes or hooks are suitable. A single strong thread should be used for buttonholing on hooks or domes, and finer thread for sewing tiny fastenings on to very lightweight materials.

Following are detailed instructions for securing each type of fastener:—

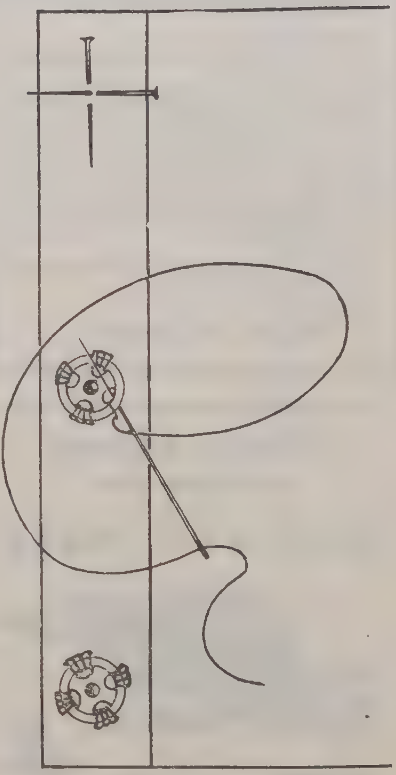
Domes (Snap Fasteners)

Mark the positions of the domes, using pins or tailor's chalk. If the fabric is light and the pins tend to drop out, cross each with another pin.

Sew the ball parts on the upper portion of the placket by several buttonhole stitches into each hole. No stitches should show through to the right side of the garment. After sewing on the ball parts, close the opening correctly and mark the corresponding positions on the right side of the under part of the placket. Sew the sockets on this underlap with each socket directly over the mark, again using buttonhole stitches.

Hooks

Sew hooks on the upper side of the closing, about ⅛in. back from the edge. Make at least five or six buttonhole stitches into each rounded end, then slip the needle between the two pieces of material and bring it out at



Buttonhole stitch is used to sew on domes.

Heading photograph by Jack Welsh and Sons.

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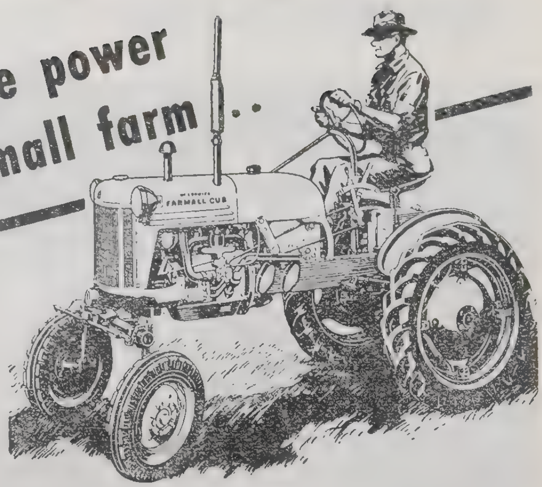

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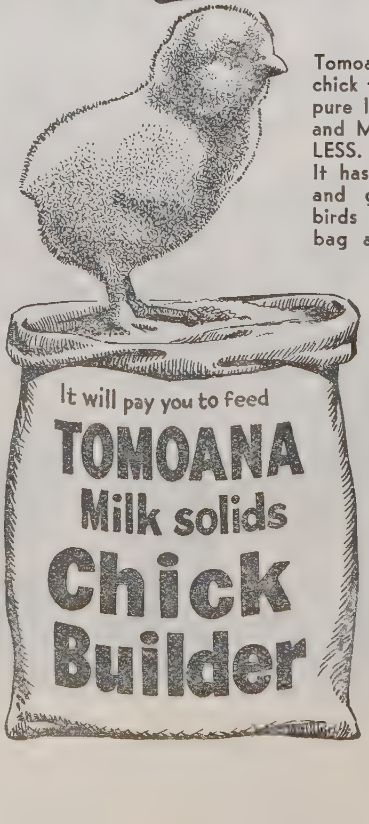

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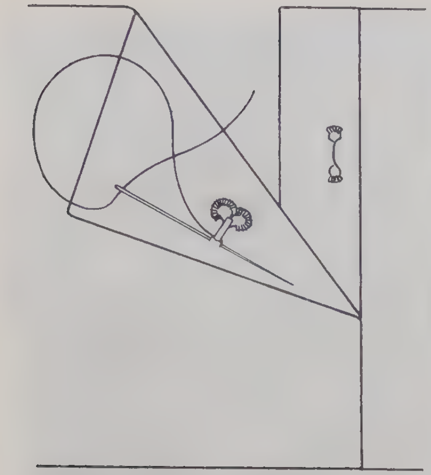


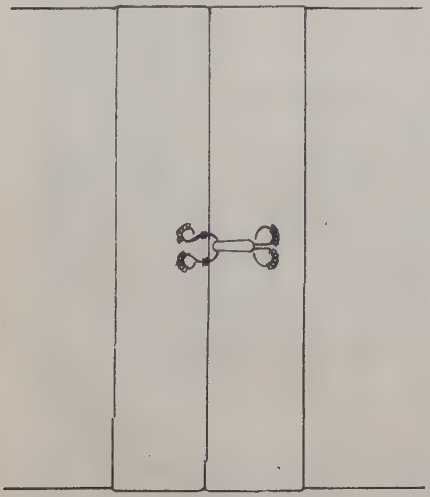
Hooks are sewn on the upper edges of openings with buttonhole stitch. The needle is shown in position for taking another stitch over the end of the hook. A straight eye is used on the placket.

the end of the hook. Take several overhand stitches over the end of the hook to prevent it from rising away from the material.

Eyes

Use straight eyes when the edges of the closing are to overlap and round eyes when the edges are just to meet. Thread loops may be used instead of straight eyes. Close the placket correctly after the hooks have been sewn on and mark the positions for the eyes at the ends of the hooks. Straight eyes are placed back from the edge on the right side of the under part of the placket. Use buttonhole stitch.

Round eyes are sewn nearer the edge of the fabric with part of the eye protruding over the edge. Use a few buttonhole stitches at the edge of the fabric to prevent the eye from lifting away from the material.



In the sewing on of a round eye two or three stitches should be taken over each side of the eye at the edge of the material.

[Jack Welsh and Sons photo.

Link buttons and buttons with loops make decorative fastenings.

Thread Loops

The choice of thread depends on the size of the loop to be made—the longer the loop the thicker the thread. Make loops for hooks the same length as the metal eyes. Mark the positions for the loops as for metal eyes. Take several stitches one on top of the other, leaving loops all the same length on the right side of the material. Do not leave the loops too loose, but do not draw them so tight that they pucker the material. Buttonhole over the loops, taking care not to catch in any of the material and keeping the stitches very close together.

Longer thread loops can be used in place of buttonholes when an edge-to-edge closing is desired.

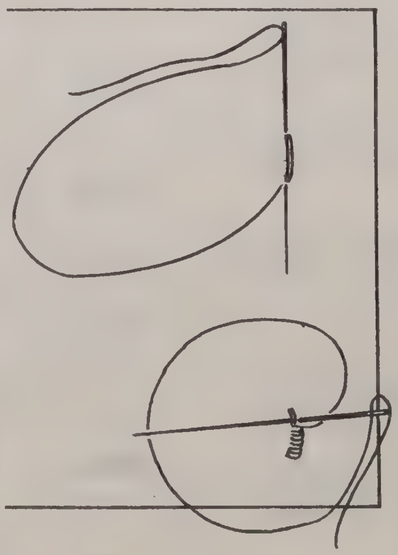
Buttonholes

Where buttons are to be used as fasteners it is usual to make the buttonholes first. For a centre front closing the outer ends of the buttonholes should lie on the centre front line. The convention is to fasten women's garments right over left (with buttonholes on the right-hand edge) and men's and boy's garments left over right. Bound or worked buttonholes may be used.

Worked Buttonholes

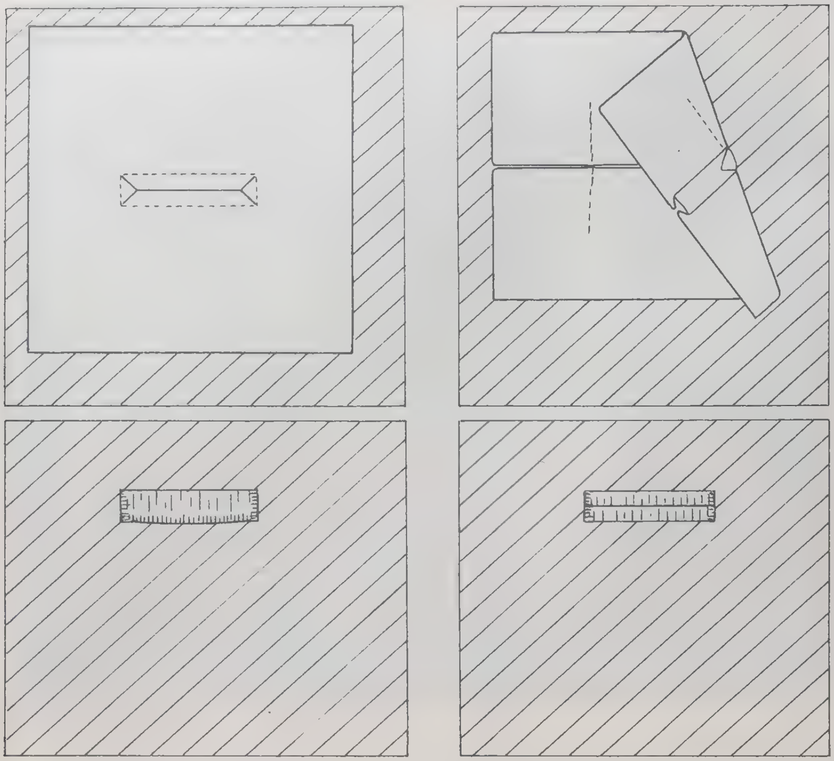
Make worked buttonholes after the edge of the garment has been faced. Mark the position for the buttonhole on the straight grain of the material unless the garment is cut on the bias. Make it just long enough for the button to pass through. Stitch round the mark twice, using a sewing machine or backstitch and making the outer row 1/10 to 1/8in. from the marked line. Cut on the line, then overcast the raw edges.

Work from right to left in buttonhole stitch, starting at the inner end of the buttonhole, rounding the outer end (which should fall at the centre

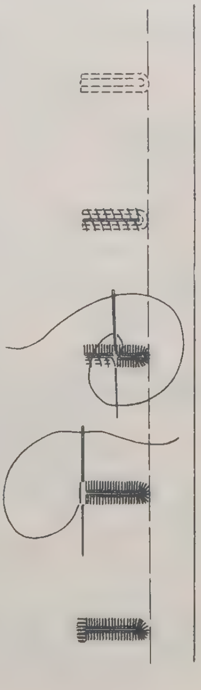


Thread loops may be used to replace straight eyes. Upper—Making the loops of thread. Lower—Buttonholing over the loops.

SEWING FASTENINGS ON GARMENTS



Making a bound buttonhole. Upper left—The binding stitched on the right side of the material and the buttonhole cut. Lower left—The binding pulled through to the wrong side. Upper right—The wrong side, showing the pleats at the ends and the stitching across. Lower right—The right side of the finished buttonhole.



A buttonhole for working marked with two rows of stitching.

The buttonhole cut and overcast.

Making buttonhole stitches from right to left.

The needle in position for the last long stitch across the end of the buttonhole to form the base of the buttonhole bar.

The completed buttonhole.

front line of the garment), and finishing at the inner end with two or three long stitches the width of the two rows of stitching, then buttonholing over this bar. Buttonhole twist or strong single thread is best, and the thread should be only long enough to complete the buttonhole.

If desired, bars can be worked across both ends instead of one end being rounded.

Bound Buttonholes

Bound buttonholes are made before the facing is turned back into position. A line of running stitches is best for making the position and length of the buttonhole. Cut a piece of material for binding, on the bias or on the straight of the fabric, making it about 2½in. wide and 1½in. longer than the buttonhole. Place it on the garment, right sides together, and tack it in place over the mark for the buttonhole. Machine stitch a rectangle the length of the buttonhole with its longer sides about 1/8in. from the mark. Start and finish the stitching on one of the long sides of the rectangle, running over the first few stitches. Make perfectly-square corners. Cut the buttonhole straight along the mark to within about 1/8in. of each end, then cut diagonally into each corner. Take care to cut to within a thread or two of the corner, but do not cut the stitching.

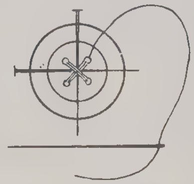
Turn the binding through to the wrong side and smooth it out so that the opening is a neat rectangular shape. The seams on the two longer sides of the rectangle may be pressed open. Fold the binding lengthwise, bringing the folded edges together at the centre of the rectangle; look at the right side to ensure an equal width of binding is showing at each side of the buttonhole. Make a pleat at each end of the binding and fix it in position by stitching (by machine or backstitch) to the triangular seam allowance. Take care to fold the garment back out of the way so that this stitching does not show on the right side of the material. Trim off any extra binding to within about ½in. of the rectangle.

Turn the facing to the wrong side and fix it into position, then mark the position of the buttonhole on it and cut it as for the buttonhole, turning in the edges neatly and hemming them down to the binding.

Buttons

Sew buttons on after the buttonholes are made unless the buttons are to be used only for decoration. The thread should be strong, particularly if the buttons are to be used as fastenings. Close the opening, lapping it over the correct distance, then mark the positions for the buttons through the outer ends of the buttonholes. If the buttons have shanks, attach them to the right side of the garment with several over-and-over stitches, as illustrated, fastening the thread securely before and after finishing the stitches.

If the buttons have no shanks, thread shanks must be made. Fix the end of the thread by a backstitch or two on the right side of the garment where the button is to be attached, then place the button in position, and use 2 crossed pins held as shown in the illustration so that the thread loops will be long enough to provide a shank. If the fabric is very thick, such as in a heavy woollen coat, a match stick may be better than pins so that the shank will be long enough to take the thickness of the buttonhole between the button and the material to which it is sewn without causing any strain. Make stitches in the form of a cross over the pins, up through one hole in the button and down through the opposite hole to the wrong side of the garment. When sufficient stitches have been made remove the pins, draw the button up to the top of the loop, bring out the needle between the button and the cloth, and twist the thread firmly round the stitches to form the shank. Fasten the thread securely with a few stitches on the wrong side. If the button has only two holes, make the stitches parallel to the buttonhole. If preferred, parallel stitches may be taken when there are 4 holes in the button.



If the buttons are only decorative, it is not necessary to make a shank.

HEADING PHOTOGRAPH—Apart from their mild stimulating effect, tea and coffee are of almost-negligible value nutritionally and have no energy or calorie value, but there seems to be no reason why people who prefer them to water as a drink should forgo that pleasure. National Publicity Studios photo.

THE NUTRITIVE VALUE OF THE LESS-IMPORTANT FOODS

THE large number of foods commonly called "protective foods" by dietitians contain, as well as their calorie or energy value, which all foods have to a greater or less extent, the essential nutrients—vitamins, minerals, and protein—in sufficient amounts to make an important contribution to the body's requirement of one or more of them. The special nutrient content and therefore the importance of these protective foods, most of which happen to be "natural" or unrefined foods such as milk, vegetables, eggs, and fruit, have been discussed in two previous articles by Evelyn E. Moore, Rural Sociologist, Department of Agriculture, Palmerston North. This article deals with the value of foods which, generally because of their poorer nutrient content, are not to be recommended as substitutes or often even partial substitutes for the protective foods.

THESE foods may be used in addition to the protective foods to improve flavour and provide greater variety in the menu, and some of them, especially fats, are most important contributors to the energy value of the diet, particularly of hard-working men and women and energetic adolescents. They also include beverages, which are a very important part of the menu from the gastronomical point of view, though sometimes of negligible value nutritionally.

Oils and Fats

Though they may appear slightly different, all oils and fats have practically the same energy content. They are particularly-good energy foods, containing slightly more than twice as many calories as sugar, and the latest scientific evidence indicates that a combination of fats with starchy or sweet foods is more economical of the essential vitamin B_1 or thiamine than starches and sugars used alone.

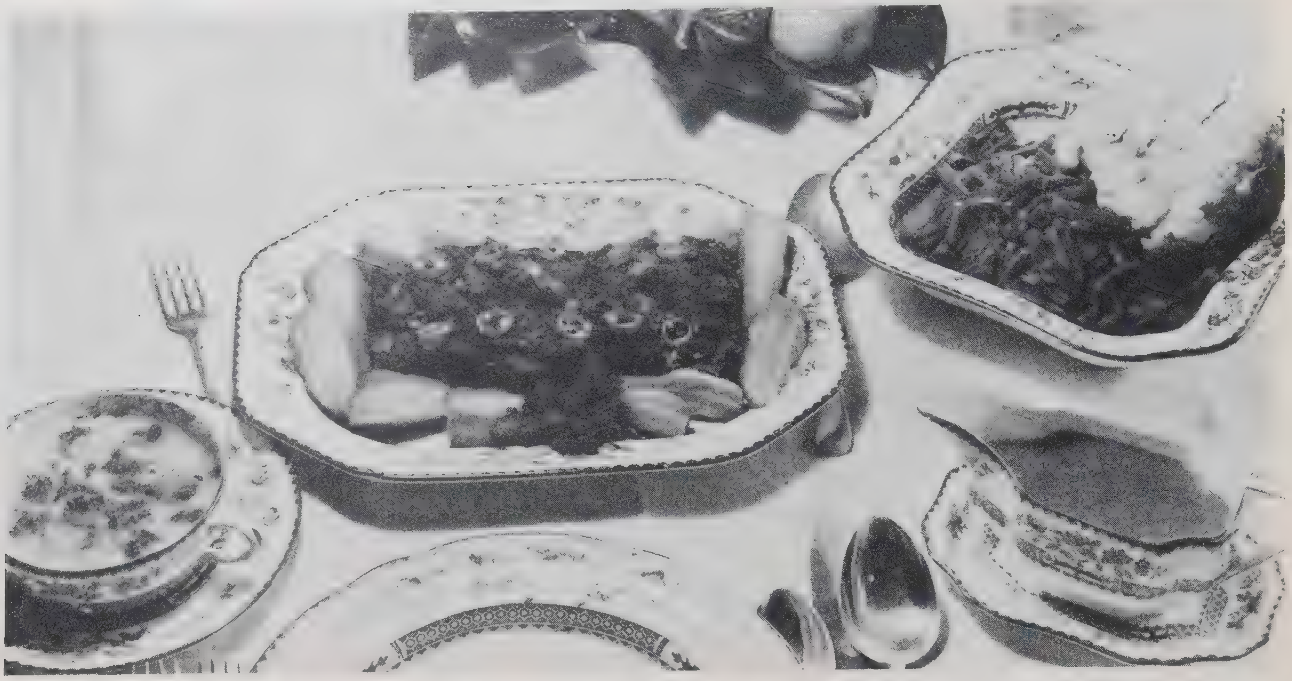
In addition, fish-liver oils and butter are protective foods. Butter is the most nutritious of the common culinary fats and oils, containing appreciable amounts of vitamin A. Fish oils are also excellent sources of vitamin A and contain vitamin D and iodine as well; in fact, they are the only foods which contain vitamin D in sufficient amounts to meet the requirements of babies and expectant and nursing mothers, who often are not able to obtain sufficient by exposure to sunshine.

As all other fats contain negligible amounts of nutrients, they are of less value and should not appear too frequently in the menus of other than people doing hard manual work, athletes, or energetic children and adolescents, for their very high energy value and small bulk may lead to their consumption in excess of energy requirements by sedentary people, causing overweight. Pastries, fried foods, roasted vegetables, and other fat foods, though certainly not harmful, are most suitable for energetic people, and certainly should be eschewed by all with a tendency to be overweight.

Sugars

Sugar, golden syrup, honey, jam, and other sweets are all good energy foods, but otherwise are of negligible value nutritionally. In addition, the popularity of sweets and sugar is regarded by nutritional authorities and dentists as one of the important causes of the high incidence of tooth decay among New Zealanders.

Different forms of sugar, such as ordinary cane sugar (sucrose), glucose, honey, and milk sugar (lactose), are often supposed, quite without reason, to vary in their nutritive value, honey, glucose, and milk sugar generally having the reputation of being better for health than ordinary sugar. That glucose does not require digestion is true, but as sugar is very easily digested, no advantage is gained by



Properly cooked and flavoured and attractively served, the common foods of the healthful diet appeal to the appetite and retain their full nutritive value, but . . .

substituting glucose except perhaps for children or invalids with digestive disorders.

The only foods in this group which have some slight nutritive value, and which therefore are to be preferred on occasions when they can conveniently be substituted for sugar or jams, are golden syrup, treacle, and black currant jam. Golden syrup and treacle are good sources of iron and calcium; 1oz. of golden syrup provides about a tenth of the daily calcium requirement and a sixth of the iron requirement of an adult, and treacle contains about 1¾ times as much iron and calcium as golden syrup. Black currant jam is the only jam which contains appreciable amounts of vitamin C, a tablespoonful containing about a tenth of an adult's daily requirement.

As well as being one of the causes of tooth decay, too much sugar may also result in an unbalanced diet and ill health because of the eating of too few of the protective foods—foods supplying minerals and vitamins as well as energy. A lot of sugary foods eaten in addition to the amounts of wholemeal bread, milk, dairy products, and other foods required to provide adequate protein, minerals, and vitamins can cause overweight just as readily as can too many fatty foods.

Consequently, the serving of only sweet biscuits and cakes for morning and afternoon teas and suppers—a frequent habit of New Zealanders—or the inclusion of more than one cake or sweet biscuit in school lunches is not advocated, and sweets should not be eaten by anyone who is overweight.

Dried Fruits

Many people may be surprised to find dried fruits included in the group of foods with low nutritive value, especially as fresh fruits are an important part of the healthful diet. However, as vitamin C, the only nutrient present in fresh fruits in valuable amounts, usually is destroyed completely when the fruit is dried, much of the nutritional value of the fruit also is lost.

Being concentrated, dried fruits have an energy value comparable to that of jam, honey, or white bread. However, though they have a greater nutrient content than honey or jam, they do not compare favourably with the white bread at present in use in New Zealand. They contain on an average less than a third of the protein and B group vitamins present in white bread and only slightly more iron. With the exception of dried apricots and prunes, they are also negligible sources of vitamin A; prunes and dried apricots are quite good sources of vitamin A, 1oz. of either providing about a fifth of the daily requirement.

Dried fruits are not to be recommended as a substitute for fresh fruits and vegetables, though they are useful for providing variety in puddings or for between-meal snacks for children when fresh fruits are expensive or scarce.

Beverages

Much has been written about the advantages and disadvantages of drinking large quantities of water and other beverages, though all the reliable evidence indicates that, except in certain cases of illness and in fevers, no advantage to health is gained by drinking excessive amounts of water or, in fact, much more than the amount of liquid required to replace adequately the losses in perspiration and other ways. The minimum requirement for these purposes is about 1¾ pints each day, but drinking rather more than this amount is probably beneficial.

Water

Though water obviously is the most natural drink, all waters are by no means equally pleasant to drink and, especially in towns or cities where it has been chlorinated, water may even taste distinctly unpleasant. Especially as no evidence appears to show that the continual use of beverages other than water has a harmful effect on health, and as many healthy people never drink water, it is doubtful whether drinking some part of the daily water requirement as "plain water" is necessary. There seems to be no reason why those people—and it includes most New Zealanders—who prefer tea, or perhaps coffee, cocoa, or fruit drinks, should forgo those pleasures.

Milk, of course, is one beverage which should always be included in the diet, for it has a nutrient value unequalled by other drinks, as well as thirst-quenching ability—in fact, it can quench thirst more successfully than plain water.

Tea, Coffee, and Cocoa

Man has discovered three plants which contain either in their leaves (tea) or seeds (coffee and cocoa) a mixture of substances with an almost universally-acceptable and agreeable flavour and containing a mild stimulant—caffein (tea and coffee) or theobromine (cocoa). Caffein and, to a less extent, theobromine are stimulants which, taken in moderate amounts, banish fatigue and clear the mind; in excess they cause sleeplessness.

Tannin is also present in tea and coffee, but, as it is extracted only very slowly, unimportant amounts are present in freshly-made tea or coffee. It is the tannin which gives the bitter or "stewed" flavour to tea or coffee which has been boiled or kept hot in contact with the leaves or grains for a long time. Excessive tannin probably has been the cause of many types of digestive disturbances, but, as the former time-saving custom of brewing a large pot of tea for breakfast and making it last the morning through is now rare, probably few people consume sufficient tannin to affect their health adversely.

In other respects tea and coffee are of almost negligible value nutritionally, and they have no energy or calorie value. Milk coffee and tea with milk are of value in proportion to the amount of milk they contain, and milk coffee is an excellent alternative for people who dislike drinking milk. However, it is reasonable to postpone a child's taking tea or coffee until he is grown up, if only because it is likely to prevent his drinking milk.

Though cocoa or chocolate, unlike tea and coffee, has some slight energy value, it is almost equally unimportant nutritionally because little cocoa powder is used in a cup of cocoa, most of the nutritive value being provided by the milk. Its chief advantage, especially for children, is that it makes a pleasant warm drink.

Mineral Waters, Soft Drinks, and Fruit Syrups

No appreciable nutritive value is contained in mineral waters, soft drinks, or fruit syrups. The water base in mineral waters may contain some mineral salts—usually those least likely to be deficient in the diet—and sodium bicarbonate, which may be a palliative for indigestion. The remainder are sweetened with sugar or saccharine, flavoured sometimes with concentrated fruit juices and sometimes with synthetic flavours, and impregnated with carbon dioxide under pressure; fruit juices used for flavouring are usually preservatised.

The flavourings and preservatives used in the preparation of such drinks have been shown by careful experimentation to be harmless in the amounts present, but they are, like tea and coffee, negligible sources of minerals and vitamins. Often they contain quite large amounts of sugar and acid, which, if they are used too frequently, may induce tooth decay. In addition, their use should not be allowed to preclude the consumption of adequate amounts of milk by children.

In bottled or tinned fruit juices, on the other hand, the vitamins are usually well conserved, so that, if desired, those made from fruits of higher nutritive value, such as oranges and pineapples, may be used occasionally to supplant fresh fruit on the menu.

Alcoholic Drinks

Probably very few consumers of alcoholic beverages delude themselves that they take them for the benefit of their health. Apart from their alcohol content, most alcoholic drinks are little different from soft drinks in their nutritive value.

The energy value of beer and wines is not greatly different from that of milk, but they are negligible sources of other nutrients. Beer has a greater nutritive value than wine, containing about 10 times as much vitamin B and protein, but even then it contains only about a tenth as much of these nutrients as milk. Spirits have no nutritive value.

The effect of alcohol on health has been much discussed, and the attitude of the nutritionist has perhaps been summarised best by Professor V. H. Mottram, a noted English nutritionist, who states in "Human Nutrition" that: "While the danger of all but the strongest alcoholic drinks has been exaggerated, alcohol is, none the less, a narcotic depressent, which brings about its effects by paralysing the higher psychological characteristics."

"Under the influence of alcohol, accuracy, avoidance of accident, tactful handling of colleagues and subordinates, observance of discipline, punctuality, reticence in matters of confidence, are all jeopardised," states a British Government publication called "Alcohol: its Action on the Human Organism."

Medical practice, as judged by the greatly-decreased use of alcoholic drinks in hospitals in London during the past few decades, is against its use in medicine. Dietitians recognise that, if patients are really miserable without their drink, letting them have it in moderation is better than forbidding it.

Professor Mottram concludes that: "In general the nutritionist is mildly contemptuous of processes that waste quite a percentage of the food values of cereals and fruits in order to make expensive beverages of a doubtful dietetic value, however pleasant they may be."

Proprietary Foods

No matter how good they are claimed to be, proprietary foods usually are expensive luxuries. They include all the vegetable and meat extracts, malt and malted foods and drinks, vitamin

. . . over-cooking, unattractive serving, or lack of variety and flavour may greatly decrease the nutritive value and cause lack of interest.

[*Sparrow Industrial Pictures Ltd. photos.*

[Sparrow Industrial Pictures Ltd. photo.

Foods such as these form the basis of a healthy diet, and they are worthy of good treatment in preparation and presentation. Some of the foods mentioned in this article play an important part in this respect.

preparations, and yeast preparations. Though many of them are now good sources of one or more vitamins and minerals, they are not necessary constituents of a well-balanced diet. They are often very useful in cases of illness, and some of them, especially yeast and meat extracts and malted milk preparations, are popular and useful for sandwich fillings, drinks, and flavouring foods, but used in these ways they usually do not contribute much toward the daily vitamin or mineral requirement of the body.

Vegetable and Meat Extracts

As well as the substances responsible for their flavour, vegetable extracts contain quite a large amount of vitamin B_1 or thiamine and smaller amounts of riboflavin compared with equal weights of other foods. However, in the amounts normally used they provide very little of these vitamins. For example, a teaspoonful of vegetable extract, which is a very large serving, provides about a fifteenth of the daily vitamin B_1 requirement of a moderately-active man and thus is comparable in this respect to a thin slice of wholemeal bread (1oz.).

Meat extracts contain much less vitamin B_1, but proportionately more of the other vitamins in this group—riboflavin and niacin. One teaspoonful may contain about a tenth of the daily niacin requirement. Their greater popularity as flavourings in soups, gravies, and drinks also means that when they are used frequently meat extracts make a useful contribution toward the daily requirement of these vitamins. Yet their cost, their complete lack of energy value, and the fact that they contain no protein make them expensive sources of these vitamins compared with wholemeal bread, milk, and even meat.

Yeast Preparations

Research has shown the nutrient content of live yeast cells, whether dried, compressed, or in liquid form, to be unavailable to the body because the yeast cells resist digestion and pass through the body unchanged. Therefore, apart from their possible value as laxatives, these preparations are useless nutritionally. It has even been shown that sometimes they may absorb vitamins from the other food eaten and therefore rob the body of its vitamins.

Pasteurised yeast and yeast preparations in which the cells have been killed by heat have a food value comparable to that of vegetable extracts.

Malt Extracts and Malted Foods

Malt extracts and malted foods are not nearly as nutritious as they are often supposed to be. Malt extract contains sugar, maltose and dextrin (both products of the partial digestion of starch), and a small amount of diastase, which changes starch to sugar, but which is of doubtful value for even the confirmed dyspeptic. It contains only small amounts of the B group of vitamins and insignificant amounts of other nutrients, so it is little better then golden syrup or treacle as a food, if as useful. When cod-liver or halibut-liver oil and orange juice are added it is of slightly greater food value, but most nutritionists would recommend that the fish oil itself and fresh fruit are preferable sources of vitamins A, D, and C.

Malted milk and other dried milk or milk and cocoa preparations have a much higher food value than malt extract, though they are relatively expensive compared with plain dried milk or milk cocoa. However, if they make otherwise-unacceptable milk palatable, there is some justification for their use in milk drinks.

Wheat Germ and Wheat-germ Preparations

Like other special foods rich in nutrients, wheat germ is not essential to a well-balanced diet, but because when bought loose it is a much cheaper source of nutrients than patented foodstuffs, there is more justification for its inclusion. When wheat germ is incorporated in cereal puddings, porridge, or bread its nutrient value is all retained; in baking powder breads, scones, biscuits, and puddings quite a lot of the thiamine may be destroyed, so that, unless the flavour of wheat germ is specially preferred in these foods, this is a wasteful way in which to use it.

Packeted wheat germ is often more easily obtainable, but has no special advantages from the nutritive point of view, for ¼oz. of either (1 tablespoon) provides more than an eighth of the daily vitamin B_1 requirement and fair amounts of the other vitamins in this group. It also contains much vitamin E, a vitamin which is, however, probably supplied in adequate amounts by all but the poorest diets or is able to be made by Man himself, just as most animals are able to make their own vitamin C.

Vitamin Preparations

For most people vitamin preparations are neither necessary nor desirable. It is far better to eat good food such as milk, eggs, fruits, and vegetables, for they provide other nutrients as well as vitamins, and nutritionists admit freely that much has still to be found out about the nutrients, including some perhaps as yet undiscovered, essential for health and the amounts most beneficial to mankind. Until this is known with certainty, it is better to obtain them from a mixture of natural foods, which are more likely to contain them all.

Condiments

Though the part played by condiments in the diet belongs more to a study of the art than of the science of food, no one will deny that they are of great importance.

Only the person condemned to a salt-free diet can savour the true value of salt in cookery; the menu lacking such common flavourings as vinegar, onions, parsley, pepper, and spices would be equally wanting in flavour. Some of them contain vitamins and minerals, but they are all used in such small amounts that they make no significant contribution to the need for either nutrients or calories.

Influence on Eating Habits

In these articles the nutritional value of most of the common groups of foods and the need for including in the diet adequate amounts of the protective foods have been discussed. The other foods, because they serve to garnish the plain, everyday milk, bread, or potatoes are useful, too, for they can transform the dullest meal into a repast fit for a gourmet. However, like the garnish on a salad, they should not be overdone, especially for children, for they may cause the development of eating habits which preclude the consumption of adequate amounts of the foods essential for health and fitness.

THE "NEW LOOK" IN AN OLD KITCHEN

By EVA TOPPING, Rural Sociologist, Department of Agriculture, Auckland.

MANY country women prefer a large kitchen because they like plenty of room in which to move around, a place for a meal table, and floor space for young children to play where they can be watched, but even the most ardent advocates of the large kitchen probably would consider one 19ft. x 16ft. too large for convenience. The owners of the kitchen illustrated in these pages certainly were of the opinion that this area could be used to better advantage, and the pictures of the remodelled kitchen on the next 2 pages prove how successful they have been, for now they have a modernised kitchen, a separate dining-room, and a well-planned pantry.

THE pictures and original plan of the kitchen premises below make apparent the many inconveniences. The preparation of meals and the subsequent clearing up entailed much walking and waste of effort. Now those disadvantages have been eliminated, and with extra window area and fresh wall treatments the kitchen has been so altered as to be almost unrecognisable.

Kitchen and Pantry

In place of the former dark and dreary varnished wood walls, the kitchen and pantry are now finished with gleaming white enamel. The floor is covered with red jaspe linoleum—an inlaid linoleum with an all-over streaky pattern—and curtains of white cotton patterned in red complete a bright and attractive colour scheme.

New windows have been built in the end wall. One of them is directly over the sink bench, thus making the alcove containing sink and stove very well lit.

The stainless-steel sink bench of generous proportions, with drawers and cupboards below, is a modern improvement on the former arrangement. A shallow bench with 2 drawers and cupboards gives extra storage and working surface under the original window retained in the side wall. The former dresser and safe fitment has been replaced by the outside door, and on the same wall a useful baking bench with a marble top has been constructed under the window. To make room for the bench, the fanlights above the window were eliminated and the window raised.

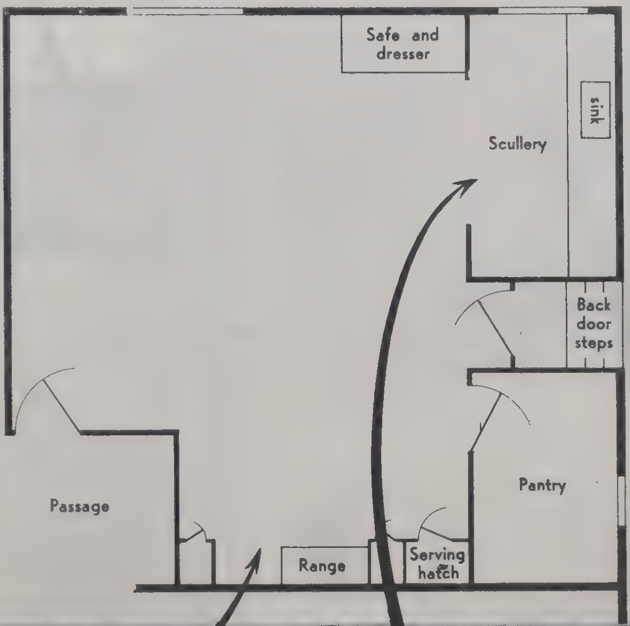
The pantry to the left of the baking bench is lit with 1 narrow window, and space for a refrigerator has been left between the open shelves and the cupboard. Both shelves and cupboards are shallow, making crockery and stores easily accessible.

The Dining-room

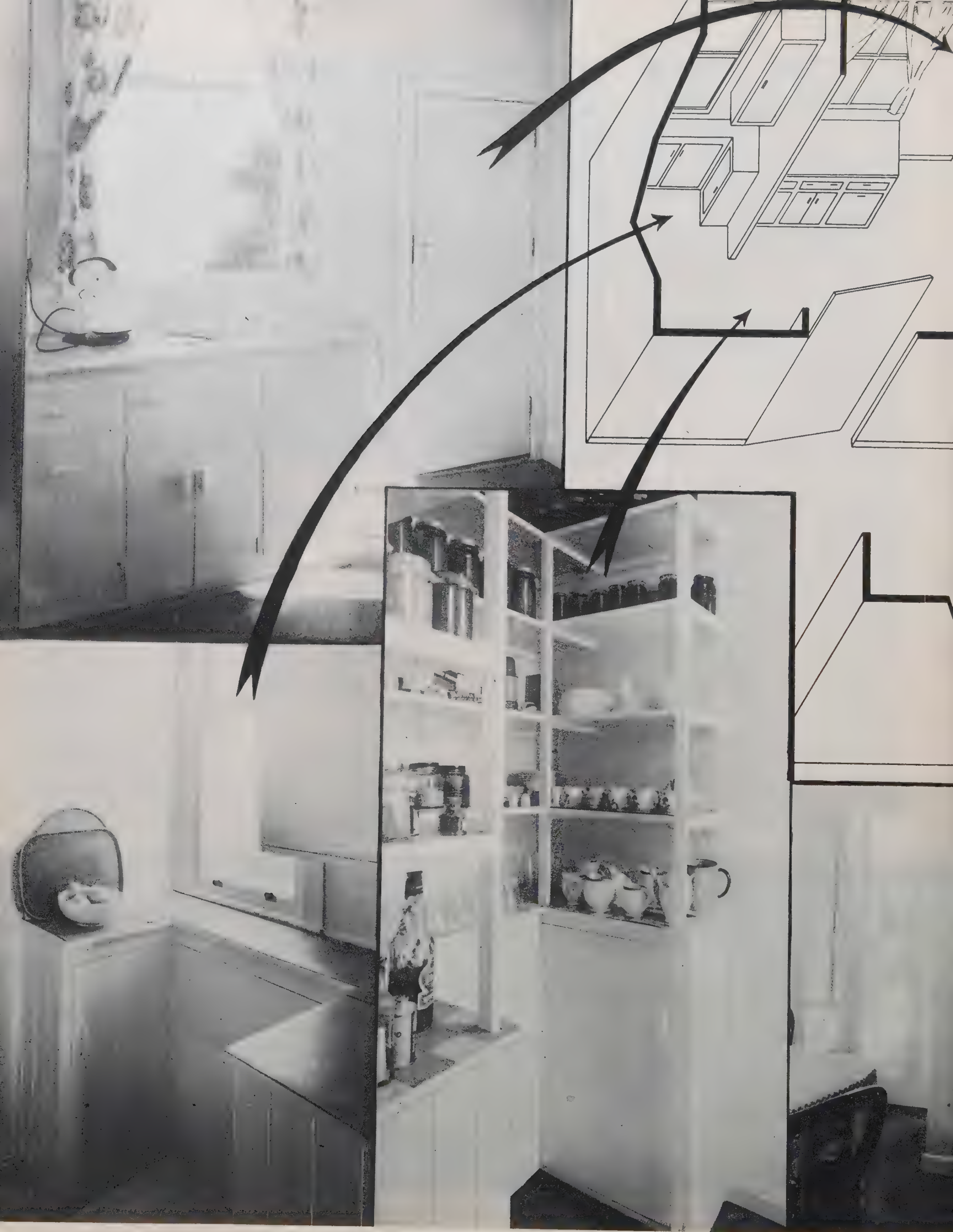
The former pantry is now incorporated with part of the original kitchen to provide a dining-room, lit by wide windows which match those over the kitchen sink, thus giving a uniform appearance from the outside. Glass doors leading into the lounge give additional light, an appearance of spaciousness, and more convenient access between the 2 rooms. The former recess for the range has been used for a built-in sideboard, with roomy china and silver cabinets and cutlery drawers.

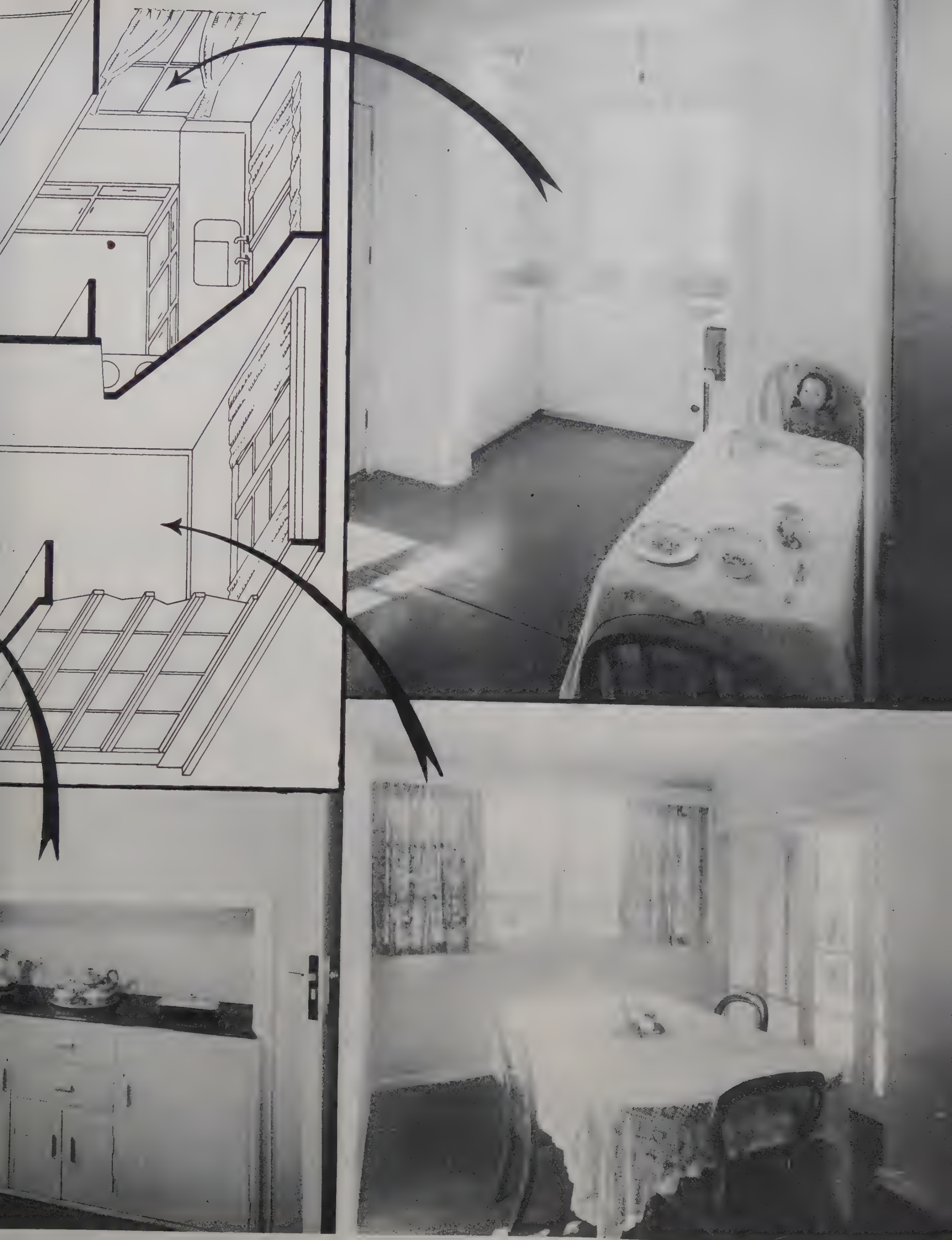
The walls in the dining-room are finished in peach beige, the wall-to-wall carpet is a soft green, and the curtains of printed linen have a pastel green background with a pattern in which peach, brown, and greens predominate. The top of the sideboard fitment has been stained and french polished to match the dining table and mahogany chairs.

THE ORIGINAL PLAN



[Photographs above and on next 2 pages by Sparrow Industrial Pictures Ltd.





Rag Rugs

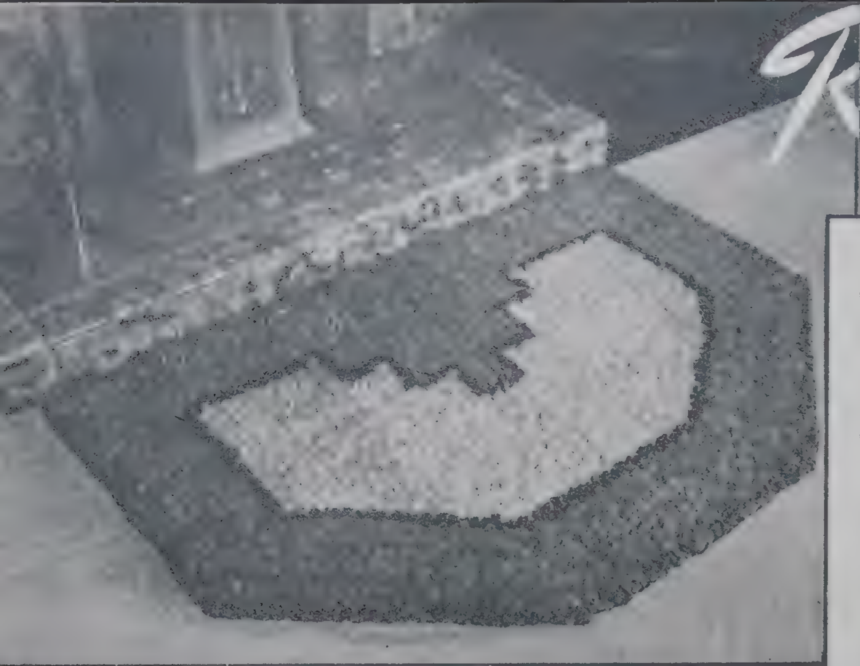
Many housewives have tried their hands at some type of rug making, but here is a little-known method which combines the virtues of simplicity, speed, economy, and an attractive result. For example, the bathroom rug illustrated was made in three evenings from "waste" materials and cost about two shillings.

The basis is two clean sacks the size of the rug required, on one of which a design is drawn in thick black pencil or coloured chalk. A search through the rag-bag probably will reveal enough old woollen garments and pieces of cloth to suffice for the "pile." If their colour does not appeal, they may be dyed.

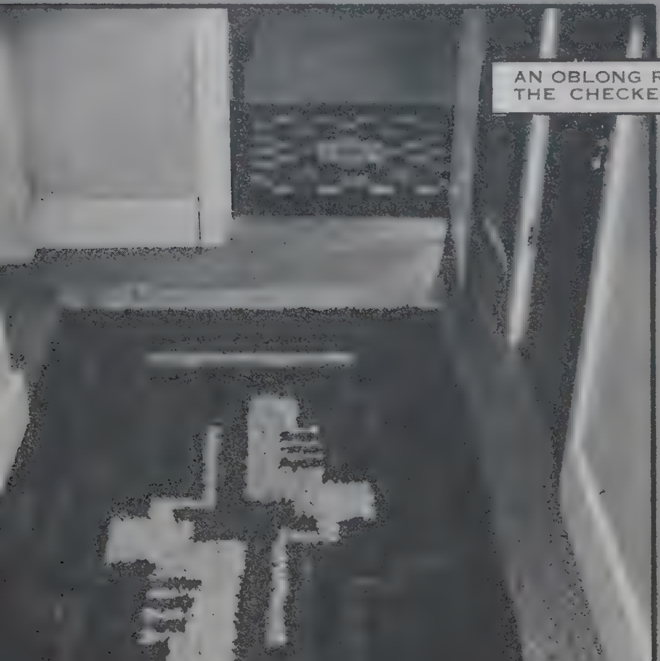
The material is cut first into 1in.-wide bias strips and then into 1in. squares. The sewing machine is threaded with strong cotton and a start made inside the border at one corner of the design on the marked sack. A square of the appropriate colour is folded in halves, put under the machine foot fold foremost, and stitched through its centre to the sack.

Square after square is then sewn on, each ½in. behind the preceding one, covering one outline of the pattern all round the rug without breaking the thread. A change is made to another colour and another outline made until a skeleton of the pattern is formed. The design can then be filled in with rows ½in. apart, finishing with the border.

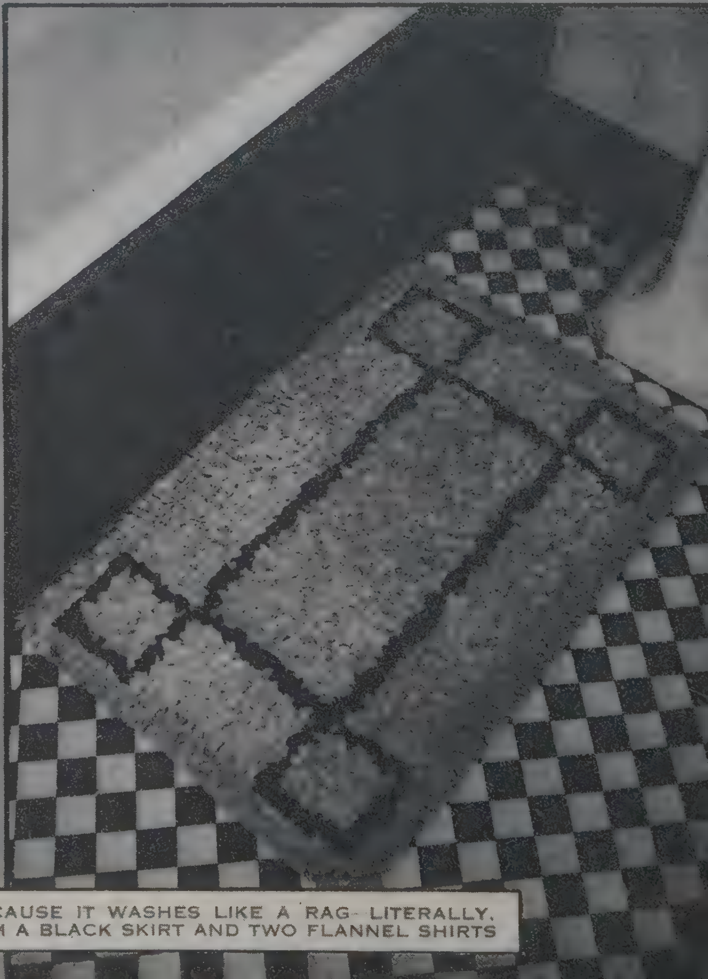
The final step is to turn back the edges of the rug and back it with the second sack.



RUGS CAN BE MADE IN A VARIETY OF SHAPES SIX-SIDED LIKE THIS HEARTHRUG, OVAL, SQUARE OR LONG AND NARROW



AN OBLONG RUG WITH FRINGED ENDS CAN GRACE A HALL, AND THE CHECKERBOARD DESIGN IS APPROPRIATE TO A KITCHEN



A FINE BATHMAT BECAUSE IT WASHES LIKE A RAG—LITERALLY, AS IT WAS MADE FROM A BLACK SKIRT AND TWO FLANNEL SHIRTS

Hand-knitted Summer Woollies for a Child

A SMART two-piece woollen suit to keep the youngest member of the family safe from chills when the sun goes in consists of a pilch and a jersey which tucks into it, the straps passing through loops on the shoulders and buttoning at the front. A quickly-knitted pattern gives the effect of raised spots on the stocking stitch.

THE materials required are 5oz. of 3-ply lamb's wool or baby wool, a pair of No. 10 knitting needles, 2 large buttons, and 6 small ones.

The measurements are:—Pilch: Length down centre, 10½in.; width all round widest part, 24in. Jersey: Length from shoulder, 10½in.; width all round under arms, 18in.; sleeve seam, 7in.

The tension should be 8 stitches and 11 rows to 1in.

Abbreviations used are: K., knit; p., purl; sts., stitches; rep., repeat; tog., together; inc., increase; dec., decrease.

Cast on 24 sts. and work in pattern as follows: 1st row (wrong side): P. 2nd row: K. 3rd row: P. 4th row: * K. 3, p. 3 tog.; do not slip these sts. off the needle, but k. 1 and p. 1 into these 3 sts., then slip them off the needle. Rep. from * to the end. 5th row: P. 6th row: K. 7th row: P. 8th row: * P. 3 tog.; do not slip these sts. off the needle, but k. 1 p. 1 into them, then slip them off the needle, k. 3. Rep. from * to the end. These 8 rows form one pattern.

** Continue in pattern, but inc. 1 st. at both ends of the next and every following row until there are 40 sts. Then cast on 4 sts. at the beginning of every row until there are 96 sts. Continue in pattern, but dec. 1 st. at both ends of the 5th row and every following 4th row until 68 sts. remain. Continue without further shaping until the work measures 9in. from the beginning. **

Work 10 rows in k. 1, p. 1 rib. Next row: Cast off 9, rib until 18 sts. are on the needle, cast off 14, rib until 18 sts. are on the needle, cast off 9. Join the wool to the first set of 18 sts. and continue in rib, but dec. 1 st. at both ends of the next and alternate rows until 10 sts. remain.

Continue without shaping for a further 13in., then make a buttonhole as follows: Next row: Rib 3, cast off 4, rib 3. Next row: Rib 3, cast on 4, rib 3. Work 2 more rows in rib, then dec. 1 st. at both ends of every row until 2 sts. remain. K. 2 tog. Fasten off.

Work the second strap in the same way.

Front of Pilch

Cast on 24 sts. and work in pattern as given for the back until the 4th row of the 3rd pattern has been worked. Then work as given for the back from ** to **.

Continue until the work measures 10in. from the beginning. Work 10 rows in k. 1, p. 1 rib. Cast off ribwise.

Leg Bands

Join the cast-on edges, then with the right side of work facing pick up and k. every st. round the leg edge. Work ¾in. in k. 1, p. 1 rib. Cast off ribwise.

Back of Jersey

Cast on 72 sts. and work 2in. in k. 1, p. 1 rib. Change to the pattern as given for the pilch and continue until the work measures 7in. from the beginning.

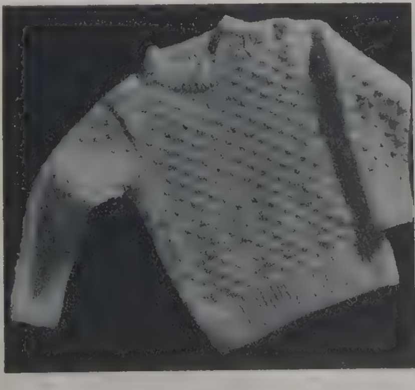
Armhole shaping: Cast off 4 sts. at the beginning of the next 4 rows, leaving 56 sts. Continue on these sts. until the work measures 9¾in. from the beginning.

Next row: Pattern 17, cast off 22, pattern to the end. Work 5 rows on the last 17 sts. Cast off. Join the wool to the neck edge of sts. for the other side and work 5 rows. Cast off.

Front of Jersey

Work as given for the back until the work measures 9in. from the beginning.

Neck shaping: Next row: Pattern 25, cast off 6, pattern to the end. Continue on the last set of 25 sts. as follows—Next row. Work to neck. Cast off 3 sts. at the beginning of the next row and next alternate row, then dec. 1 st. at the neck edge on the next 2 rows. Continue without further shaping until the work measures 10¾in. from the beginning. Cast off. Join the wool to the neck edge of sts. for the other side and work up this to match the first.



Sleeves

Cast on 36 sts. and work 2in. in k. 1, p. 1 rib. Change to the pattern as given for the pilch, but inc. 1 st. at both ends of the 5th row and every following 4th row until there are 60 sts. Continue without further shaping until the work measures 7in. from the beginning, then shape the top by dec. 1 st. at both ends of every row until 24 sts. remain. Cast off.

Neck Bands

For the front neck band have the right side of the work facing. Pick up and k. every st. round the neck edge, then work ¾in. in k. 1, p. 1 rib. Cast off ribwise.

Repeat the process for the back neck band.

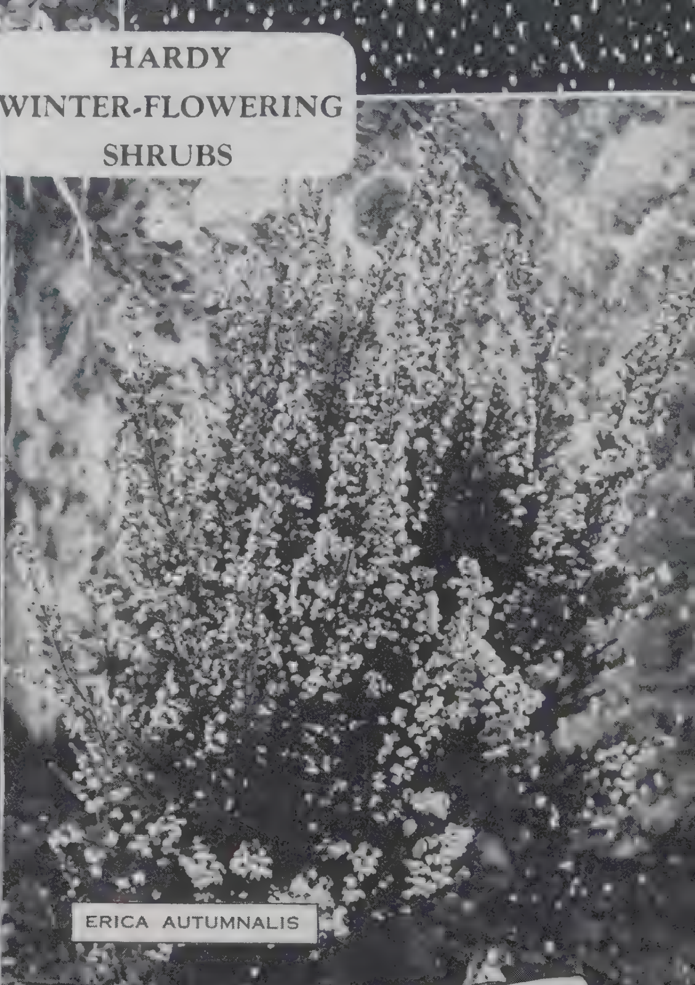
Making Up

Press the work lightly on the wrong side. Join the side seams of the pilch and press them. Sew the two large buttons on to the front waist ribbing to fasten the straps.

Join the shoulder seams of the jersey for 1in. from the armhole edge. Sew in the sleeves, then sew up side and sleeve seams. Work 3 loops on each front shoulder, then sew on small buttons to correspond with the loops. Work a large loop across each shoulder for holding the pilch straps in position.

HARDY WINTER-FLOWERING SHRUBS

GARRYA ELLIPTICA

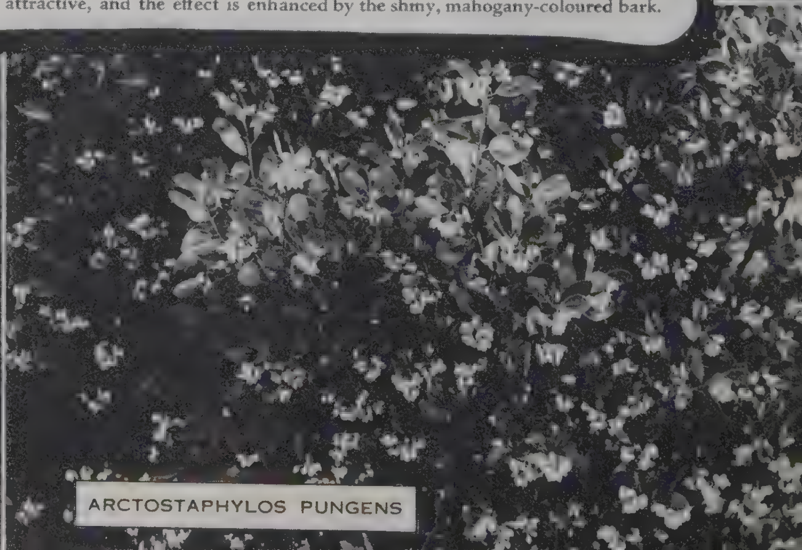


ERICA AUTUMNALIS

COTONEASTER ROTUNDIFOLIA

Erica autumnalis is not perfectly hardy in districts where frosts of more than 12 degrees are experienced, but if it is planted in a well-drained situation at the base of a rock or against a wall where it receives some protection, it will flower throughout the winter. *Garrya elliptica* is an evergreen shrub, growing to 6 to 8ft. high, with dark green foliage. The long, catkin-like flowers develop during July, when there is a dearth of colour in the garden. *Cotoneaster rotundifolia,* a berried shrub worthy of wider cultivation, is deciduous and grows only about 4ft. high. During the winter and right into October it is covered with scarlet berries, the flavour of which, fortunately, is not appreciated by birds. *Erica carnea,* a dwarf heath which grows only about 1ft. high, is admirably adapted for planting as a single specimen, for grouping in a shrubbery, or for edging borders. The flowers of a rich carmine pink are in full bloom during July and August. *Erica darleyensis,* a hybrid form of *E. carnea,* grows about 2ft. high and begins to bloom in early June, lasting through the winter. *Arctostaphylos pungens* eventually reaches the dimensions of a small tree. The white pink-flushed flowers, which are borne during July, August, and September, are particularly attractive, and the effect is enhanced by the shiny, mahogany-coloured bark.

ERICA CARNEA



ARCTOSTAPHYLOS PUNGENS

Care of Spring-flowering Bulbous Plants

DURING October the great majority of spring-flowering subjects will reach the height of their glory, such plants as wallflowers, forget-me-nots, polyanthus primroses, and tulips being in full bloom. However, toward the end of the month most of them will have passed the full flush of their beauty and will start to decline as they pass out of flower—indeed, the hyacinths and many of the narcissi already will be spent. With their passing the gardener is confronted with the problem of how to dispose of them so that the space that they occupied in beds and borders may be cleared and prepared in readiness to receive the summer- and autumn-flowering subjects that should be planted out during the following month. Advice on this subject is included in this month's article for the flower gardener by M. J. Barnett, Director of Reserves to the Christchurch City Council.

[Douglas Elliott photo.

SUCH plants as wallflowers and forget-me-nots are easily raised from seed each year and there need be no compunction about disposing of them in the compost heap, but tulips, narcissi, and hyacinths are too valuable and too hard to come by to be so ruthlessly destroyed, and yet to allow them to remain in ground required for succeeding planting until the foliage has ripened off would delay seasonal work too long. Therefore, to allow the work of summer planting to proceed to schedule, the bulbs must be lifted and heeled in somewhere else to complete the ripening off of the foliage.

Bulbous plants such as hyacinths, narcissi, and tulips start to develop root systems immediately they are planted out in late summer and autumn. In spring the leaves appear above ground and, with the lengthening of the days, rapidly reach their maximum growth. The flower heads appear in due course, and with their passing the leaves begin to fade gradually, though they continue to function for some weeks after—that is, they continue to send down to the bulbs the food material or sap that has been elaborated in their tissues. To a large extent, the general health and flowering capacity of the bulbs for the succeeding year will depend on the supply of food material from the leaves. Therefore it is necessary that the foliage be retained intact as long as possible—in other words, until it has ripened off.

When the bulbs have to be lifted before this process has been completed certain precautions are necessary to offset the ill effects caused by this undue but necessary interference with the natural course of events. The bulbs should be lifted with the foliage intact and with as much of the root system as it is possible to obtain with ordinary care. Immediately after being lifted they should be taken to the reserve garden and properly heeled in. Failing a reserve garden or small nursery, any vacant piece of ground at the back of a shrubbery or a part of the vegetable garden will suffice. Once lifted, bulbs must not be exposed to bright sunlight or drying winds. If heeling in forthwith is not convenient they should be covered with a damp sack in the meantime. To prevent the foliage from becoming unduly damaged and tangled with the bulbs, when lifted they should be placed in trays with the foliage laid out straight in one direction. Tulips require more careful handling than narcissi, as the foliage which envelops the flower stem at its junction with the bulb is very brittle and is easily broken off with rough usage. All flower heads that have developed seed pods should be removed.

Once heeled in, the bulbs can remain undisturbed until late summer, when they should be lifted, cleaned, and graded in readiness for next season's planting.

Summer Bedding Displays

If not already attended to, arrangements should be made not only for the supply of plants required for beds and borders but also for the scheme of planting contemplated. In large establishments where many thousands of plants are required the bedding schemes are prepared 6 months and even a year in advance. Many amateurs depend on supplies from nurserymen, but even when the plants required are obtained from outside sources the placing in advance of an order for the numbers and kinds of plants desired is of advantage to both parties.

When a planting scheme is being decided on several factors need to be taken into consideration. The first essential is to select types of plants that will succeed in the soil and situation. Some gardeners tend to try something new in place of those of

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All photographs on opposite page by Green and Hahn Ltd.

proven worth; it is not intended to discourage such attempts, but if there is any doubt about the hardiness or suitability of the plants, it is better to make small trial plantings in the mixed flower border than to take the risk of using them in large-scale display.

Another point to decide when selecting the plants is the colour scheme. Some plants harmonise with each other and others are more suitable for contrasting; for example, soft blue and pink harmonise well, and scarlet and yellow or purple and crimson provide good contrasts. When associating different types of plants the general characters of the subjects to be used should be considered so that one kind does not appear incongruous. Having solved these problems, the next point is to estimate the numbers of plants required to complete the planting scheme.

Finally, the aim should be to choose only plants or associations of plants that will provide a continuous display of colour throughout summer and autumn. Where the resources for raising successive batches of plants are available a continuous display of bloom in the flower beds can be maintained by refurnishing them as required with fresh subjects specially raised in pots or containers for the purpose, but because of the expense entailed such schemes are seldom, if ever, carried out in New Zealand.

Examples of Bedding Schemes

The following bedding schemes are submitted for consideration as examples, all of them having been carried out with success:—

Scarlet geraniums with an edging of the white-leaved *Centaurea candidissima.* If the latter is not procurable, the variegated edging geranium Madam Salroy may be used as a substitute. The white sweet alyssum Little Dorrit is also used sometimes, but it has the disadvantage of bolting to seed during dry weather and passing out of flower before the season is half over.

The orange-scarlet geranium Maxime Kavolisky with an edging of the golden-foliaged geranium Harry Hieover. Other edgings that may be used to advantage are lobelia Cambridge Blue or *Echeveria secunda.*

The pink ivy geranium Charles Turner with an edging of Cambridge Blue lobelia.

If extra height and variety in the beds are desired, fuchsias, ivy geraniums, and heliotropes may be grown on, trained as standards, and planted about 3ft. apart through the geraniums. A standard fuchsia such as Ballet Girl would be planted with the scarlet geraniums, Garten Meister Bonstedt with Maxime Kavolisky, and standard ivy geraniums or heliotrope with the Charles Turner.

The bedding dahlia Bishop of Llandaff with an underplanting of delphinium Blue Butterfly, which may also form the edging. Dwarf ageratum may be used for edging.

Any of the good yellow miniature cactus dahlias such as Tip with an underplanting and edging of blue verbena.

Petunia Pink Bedder with an edging of petunia Dwarf Violet.

African marigold Double Orange with an outer row of the dwarf Crown of Gold and an edging of the dwarf *Tagetes signata pumila.*

French marigold Harmony with an edging of the dwarf variety Spry or Legion of Honour.

Many other schemes are worth consideration. Antirrhinums may be procured in a wide range of colour. There are four distinct classes of these plants—the majus or tall varieties, which are excellent for grouping toward the backs of flower borders; the intermediate or nanum varieties, including the majestic and grandiflorum strains, which are most suitable for bedding purposes, and the bedding varieties, which may also be used by themselves in small beds, for underplanting beneath dahlias, or as an edging for large beds; and the Tom Thumb varieties, which because of their dwarf habit are admirably adapted for edging purposes.

Nemesias may be planted throughout and among antirrhinums to provide a display of colour until the antirrhinums come into bloom, by which time the nemesias will have passed over and can be removed. The following is an example of how flower beds were maintained in full bloom from November to the end of April: Dahlias were first planted at 2½ to 3ft. intervals; intermediate antirrhinums were planted at 12 to 15in. intervals through the dahlias, followed by nemesia between the antirrhinums, with Tom Thumb antirrhinums as an edging. The planting was carried out simultaneously, and the colours of the antirrhinums were chosen either to harmonise or to contrast with the colour of the dahlia. The nemesia came into bloom toward the end of November and carried on a display until January, by which time the antirrhinums were in full flower. By the middle of February the dahlias were making a good display, which was maintained until they were cut down by the early frosts of late autumn. If the seed heads are

[*Green and Hahn Ltd. photo.*

A post-and-chain fence festooned with ivy. The ivy should be trimmed back now as described in last month's "Journal."

[Green and Hahn Ltd. photo.

Hamamelis mollis, the witch hazel, is a deciduous shrub which bears bright yellow flowers in midwinter. If it is planted in front of an evergreen shrub, the dark background enhances the beauty of the flowers.

removed from the antirrhinums at the outset, they also will continue to flower.

In preparing beds and borders for planting, some attention to the requirements of the plants to be used is advisable. Dahlias, for instance, respond to liberal treatment, and ground where they are to be grown should be generously treated with organic manure beforehand. On the other hand, in such conditions geraniums would make too much rank, soft growth at the expense of flower production, so where these plants are being used it is customary not to apply any manure before planting except perhaps a light dusting of superphosphate at a rate of not more than 1oz. per square yard. To make up for the deficiency in organic matter, such beds are manured in the autumn before spring-flowering subjects such as the polyanthus primroses are planted out, whereas beds manured in spring for dahlias are not so treated in autumn and are used at that season for the planting of wallflower or tulips.

Pruning of Shrubs

As soon as the spring-flowering shrubs such as forsythias, spiraeas, and deutzias have passed out of flower they should receive their annual pruning. With the rush of work at this time of the year this operation is too frequently overlooked, with the result that in time the bushes become untidy, tangled masses of old and spent wood intermingled with the younger growths. For example, a study of the growth and habit of the forsythia shows that a number of leading shoots develop from near the base of the bush and from the lower parts of the old wood. During spring these growths (the previous year's wood) produce numbers of flowers along the stems. If left undisturbed in the following season, a number of lateral or side growths will develop from these stems, and these in turn will bear quantities of bloom in spring. However, if the stems are left for a third season, the lateral growths become shorter and fewer and serve only to clutter up the bush and prevent the production and proper development of young, strong growths which should replace the old ones.

Therefore, the object of pruning immediately after flowering is to remove as much as possible of the old wood that has flowered in order to make room for and encourage the growth of young and more vigorous shoots that will supply more bloom for the coming spring.

Such subjects as almonds, prunus, and peaches may also be pruned at this time of year, but in these cases the operation is restricted to removing decayed, damaged, and unwanted wood to keep them healthy, balanced, and well proportioned.

If necessary, evergreens such as camellias, rhododendrons, and hollies should be pruned at this season. In general, such plants require little attention, but on occasion restricting their growth or improving their shapeliness may be necessary, in which case October is an opportune time to attend to this work so that the bushes will have ample time in which to recover and develop fresh growth before the approach of next winter.

Winter- and early-flowering ericas should also be pruned now, but they must not be cut back to the old wood. The general practice is to cut them back below the flower head to where young growths are starting. The dwarf, bushy types such as *Erica carnea* can be dealt with quickly by tipping them lightly with shears.

Lawns

A close, well-kept lawn of even texture is always admired. To achieve this objective lawns should be cut regularly and frequently at this season, for if the grass is allowed to get slightly out of hand now, it will prove difficult to bring back to an even turf for the rest of the season. The grass catcher should be kept on; later in summer when growth has slowed down it can be dispensed with if need be.

To stimulate the finer grasses, assist in the eradication of weeds, and discourage the growth of clovers and some of the coarser grasses, one or two applications of sulphate of ammonia may be made either in dry powder form or as a solution. The powder form should be used on a morning when a heavy dew lies on the grass and which presages a fine sunny day, the chemical being distributed evenly over the whole surface at the rate of 1oz. per square yard. The granules of powder will alight on and be held and dissolved by the beads of moisture on the foliage; the hot sun beating down on to the acid solution thus formed will have a burning affect on the flat, fleshy leaves of such weeds as the lawn daisy, dandelion, plantain, and catsear. It is not claimed that one application will destroy the weeds, but it is sufficient to check their growth and to encourage the finer grasses to smother them. A second application within 10 days or a fortnight will prove even more effective.

If a lawn is badly infected with weeds and the grass lacks a good green colour, or where moss is present, sulphate of iron can be mixed with the sulphate of ammonia at the rate of 1 part of sulphate of iron to 4 parts of sulphate of ammonia. This mixture is more drastic in action and has a decided bleaching effect on the grasses, which, however, recover rapidly and become a much deeper green within a fortnight of treatment.

WORK IN THE FLOWER GARDEN . . .

The weedkilling hormones now on the market are advocated for eradicating weeds from lawns. Though excellent for this purpose, they do not feed or in any way promote a better growth of the finer grasses, and they must be used with the greatest of care. The slightest particle of the spray alighting on plants adjoining or flanking the lawn may prove disastrous to them. Moreover, the spraying apparatus or container used must be thoroughly washed out many times before it can be used for other purposes. If hormones are used, to be on the safe side it is better to keep one spray can entirely for that purpose.

Sulphate of ammonia and the mixture of sulphate of ammonia and sulphate of iron are both more effective when sprayed on the lawn as a solution—6oz. of sulphate of ammonia and 2oz. of sulphate of iron dissolved in 1 gallon of water or if only sulphate of ammonia is used, 8oz. of it to 1 gallon. To ensure that the solution is spread evenly over the lawn it is a good plan to divide the grass into 3ft. strips with a garden line. One gallon of the solution will spray 16 sq. yds. The texture and general appearance of a lawn can be improved further by raking the surface with a steel rake before mowing it.

Plants to Propagate

For late summer and autumn flowering, hardy annuals such as clarkias, godetias, sweet peas, and nasturtiums may still be sown in open ground as advocated in last month's "Journal."

It is not too late to sow half-hardy annuals such as African and French marigolds and zinnias. Zinnias grow rapidly and are very susceptible to cold winds. If they are sown late, kept growing without a check, and planted out in December when the weather is more settled and warmer, they frequently succeed better than those planted out a few weeks earlier. Asters for late flowering may still be sown both under glass and in the open.

Primroses and polyanthus primroses required for spring displays next year can be sown this month. As soon as they are large enough to be handled the seedlings can be pricked off into boxes or seed trays and grown on until ready for planting out in the open in March and April to flower during the following September and October.

For providing displays of flowers in a greenhouse during winter, sowings should be made of *Primula malacoides, P. sinensis, P. obconica* and cinerarias. Cinerarias germinate freely in normal circumstances, but primulas require more care. A simple seed compost to use is equal parts of sweet loam and leaf mould, well mixed, with sufficient clean, sharp, river sand added to keep it open. Five-inch or 6in. pots are a suitable size, and they should be well crocked to provide drainage. To prevent the finer compost from being washed down into them, the crocks should be covered with some rough material such as riddlings, sphagnum moss, or spent hops. The compost is then made reasonably firm but not hard, and finished off with a level and even surface to within ¾in. of the rim. Stand the pots in a basin of water until the moisture begins to show on the soil's surface. Then remove them and, after allowing the surplus water to drain off, sow the seed thinly and evenly, just covering it with a sprinkling of sand. Cover each pot with a piece of glass shaded with brown paper; the object of the glass is to prevent rapid evaporation of the moisture from the soil and that of the paper to exclude strong light, the paper being removed during darkness. Each morning the glass should be lifted, the condensed moisture removed, and the glass replaced. An endeavour should be made to maintain an even temperature of about 55 degrees F. As soon as the seed germinates freely the glass and paper should be removed, but care is still necessary. The seedlings should be lightly shaded from strong sunlight, and draughts and sudden fluctuations in temperature avoided.

War on Weeds

Weeds will be growing apace and at every opportunity means should be taken to combat them. The flat or dutch hoe is one of the best implements to use; correctly handled, it severs the weeds from their roots just below the surface and effectively stirs the surface of the soil. Nevertheless, its use in herbaceous borders is not advocated, as too frequently considerable damage is done to plants there by its injudicious use. The garden fork is a much better implement to use in such places; there is little fear of the crowns of plants or their young shoots or roots being cut and damaged by it, and it breaks up the surface soil more effectively.

The common practice of hoeing over a border and allowing the weeds to remain and wither away on the surface is difficult to avoid in large gardens where time and cost must be considered, but in the home garden the weeds should be removed. Such weeds as groundsel, shepherd's purse, ground cress, and chickweed even when cut over have sufficient sustenance left in them to ripen seeds which have already formed. Once ground becomes infected with chickweed many years of weeding are needed to eradicate it. Though it is only an annual, it is a prolific seed bearer and, as the seeds are viable in the soil for many years, if it is allowed to bear seeds but once, seedlings will continue to appear for many years afterward.

Herbaceous Perennials

Herbaceous perennial plants will be making strong and rapid growth and will require immediate attention. Some, such as perennial phloxes and asters, may have produced too many young shoots and will require thinning out. Select from 5 to 7 of the strongest and most likely shoots and remove the others.

Other plants, because of the nature of their growth, will require some support to prevent their being blown over by wind or beaten down by heavy rain. Staking may be considered to be an evil, but nevertheless it is necessary and must be attended to in good time.

Plants Recommended by the District Council of the Royal New Zealand Institute of Horticulture for Planting in the Auckland District

Evergreen Native Trees

Alectryon excelsum (titoki)
Podocarpus totara (totara)
Metrosideros tomentosa (pohutukawa) (*M. excelsa*)

Evergreen Exotic Trees

Cupressus lawsoniana aurea
Quercus ilex
Eucalyptus ficifolia
Magnolia grandiflora
Eugenia myrtifolia

Native Shrubs

Phebalium nudum
Leptospermum scoparium keatleyi
Pittosporum eugenioides (tarata)
Sophora tetraptera (kowhai) (*Edwardsia grandiflora*)
Veronica speciosa

Deciduous Trees

Paulownia imperialis
Liquidambar styraciflua
Fagus sylvatica purpurea riversi (copper beech)

Exotic Flowering Shrubs

Azalea indica
Cestrum newelli (*Habrothamnus*)
Magnolia stellata
Luculia gratissima
Prostanthera ovalifolia
Protea Susanne
Polygala grandis (*P. oppositifolia*)
Rhododendron fragrantissimum
Tibouchina grandiflora (*Lasiandra*)

Herbaceous Plants

Helianthus quertifolius Autumn Glory
Helenium Riverton Gem
Carnation Andrew Nicol
Gerbera jamesoni
Scabiosa columbaria
Salvia patens
Agapanthus umbellatus
Strelitzia reginae
Canna indica
Chrysanthemum Esther Reid

Bulbous Plants

Freesia burtoni
Lachenalia pearsoni
Narcissus Soleil d'Or
Nerine filifolia
Lilium formosum

Annuals and/or Biennials

Nemesia strumosa
Petunia Pink Bedder
Marigold Harmony (*Tagetes*)
Salvia Bonfire
Statice sinuata (*Limonium sinuatum*)

Alpine Plants

Aubrietia deltoidea
Nepeta mussini
Convolvulus mauritanicus (*Ipomaea mauritanicus*)
Campanula garganica
Dianthus species

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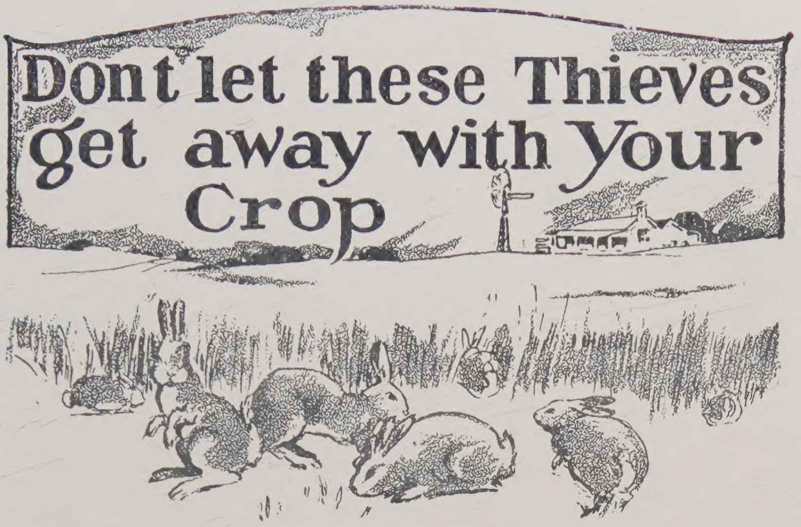
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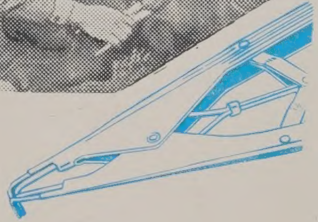

THE MODERN METHOD

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